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**Garner**

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(54) **ELECTRONIC RUN TICKET**

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(51) **Int. Cl.**

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**G06F 40/174** (2020.01)

**G06Q 50/06** (2012.01)

**G06Q 10/02** (2012.01)

(52) **U.S. Cl.**

CPC ..... **G06Q 20/047** (2020.05); **G06F 40/174** (2020.01); **G06Q 50/06** (2013.01)

(58) **Field of Classification Search**

CPC ..... G06Q 20/047; G06Q 50/06; G06F 40/174

USPC ..... 705/22

See application file for complete search history.

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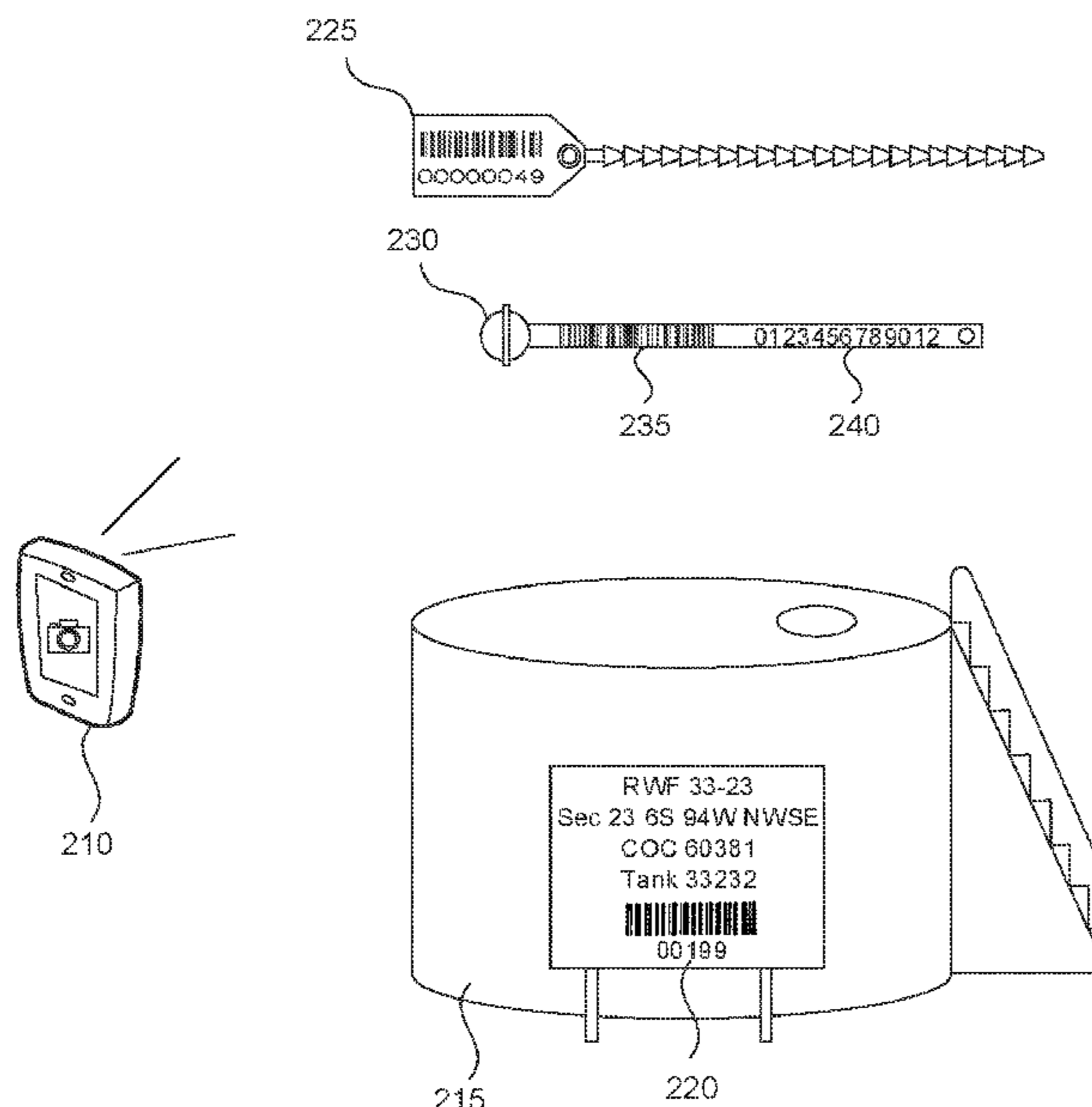
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(57) **ABSTRACT**

Technology for implementing an electronic run ticket exchange is provided. In an example method, electronic run ticket data is received from a client device, the electronic run ticket data representing a transaction for fluid. The electronic run ticket data is stored in an exchange data store. The electronic run ticket data is transformed to create additional data to be included in the electronic run ticket data, using a processor. Access to the electronic run ticket data by participants to the transaction is managed, and the electronic run ticket data, including the additional data, is reported to the participants.

**21 Claims, 12 Drawing Sheets**



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Whole Tank Run Ticket					
Lease/ PAD Name					Date
Field Name	Field Operator	COC Federal / Indian Lsc. #			Time
Legal Description			County	State	
Tank #	Tank Capacity		Lease #		
OPEN	Feet	Inches	Fraction	Tank Temp.	Gross BBLs
CLOSED	Feet	Inches	Fraction	Tank Temp.	Gross BBLs
OBS Gravity	OBS Temp	BS&W	BS&W Depth	Split with Tkt #	Total Gross BBLs
Opening Seal #		Tank Sales Valve		Production Inlet Valve	Equalizing / Overflow Valve
Closing Seal #		Open Seal #			
		Close Seal #			
		Re-Open Seal #			
Trucking Comp.		Driver's Printed Name		Driver's Signature	
Destination	Destination Facility Operator		For the Account of:	Bill of Lading #	
Producer Representative Signature					Date
Remarks:					

**FIG. 1**  
**(prior art)**



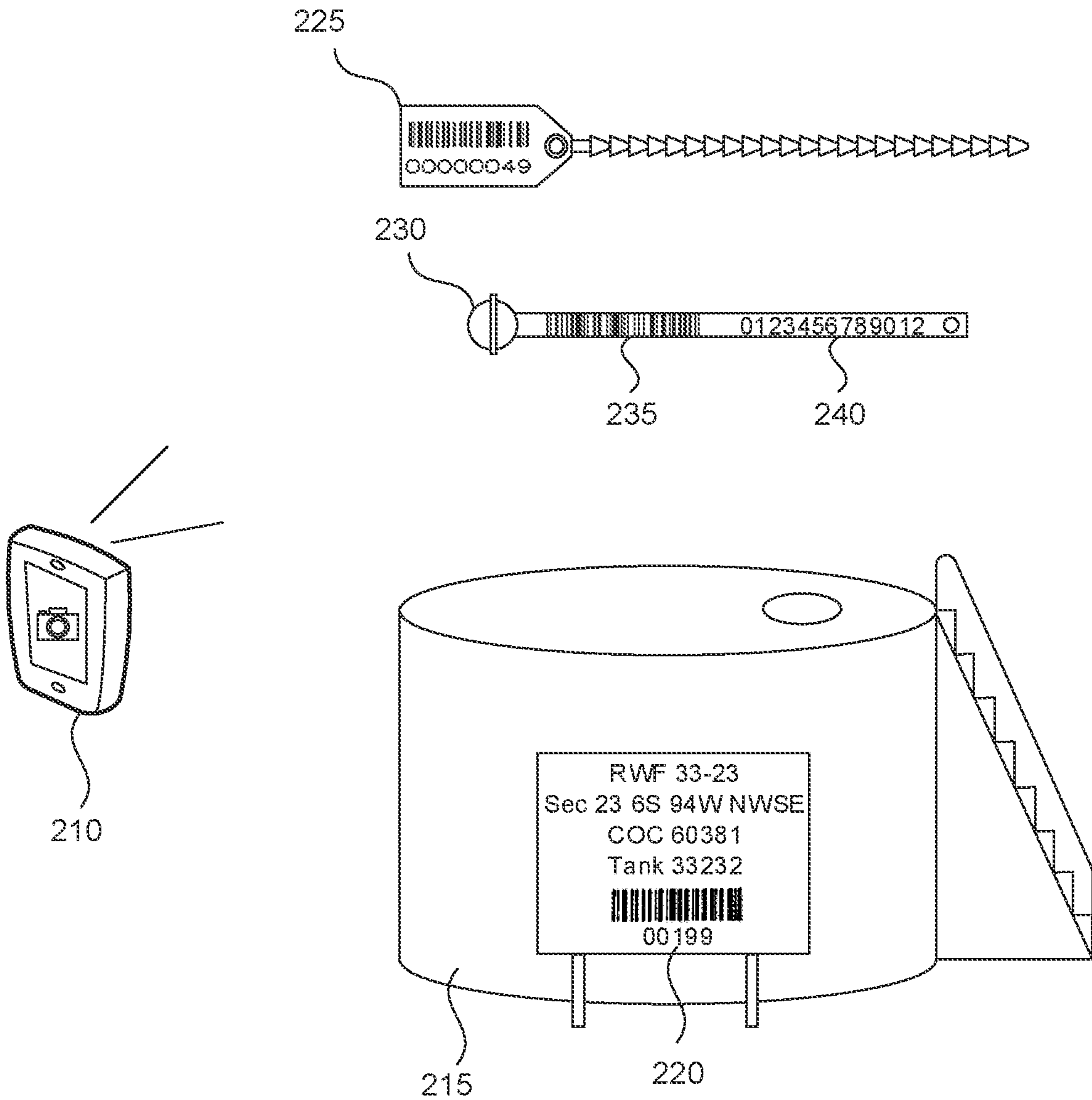


FIG. 2

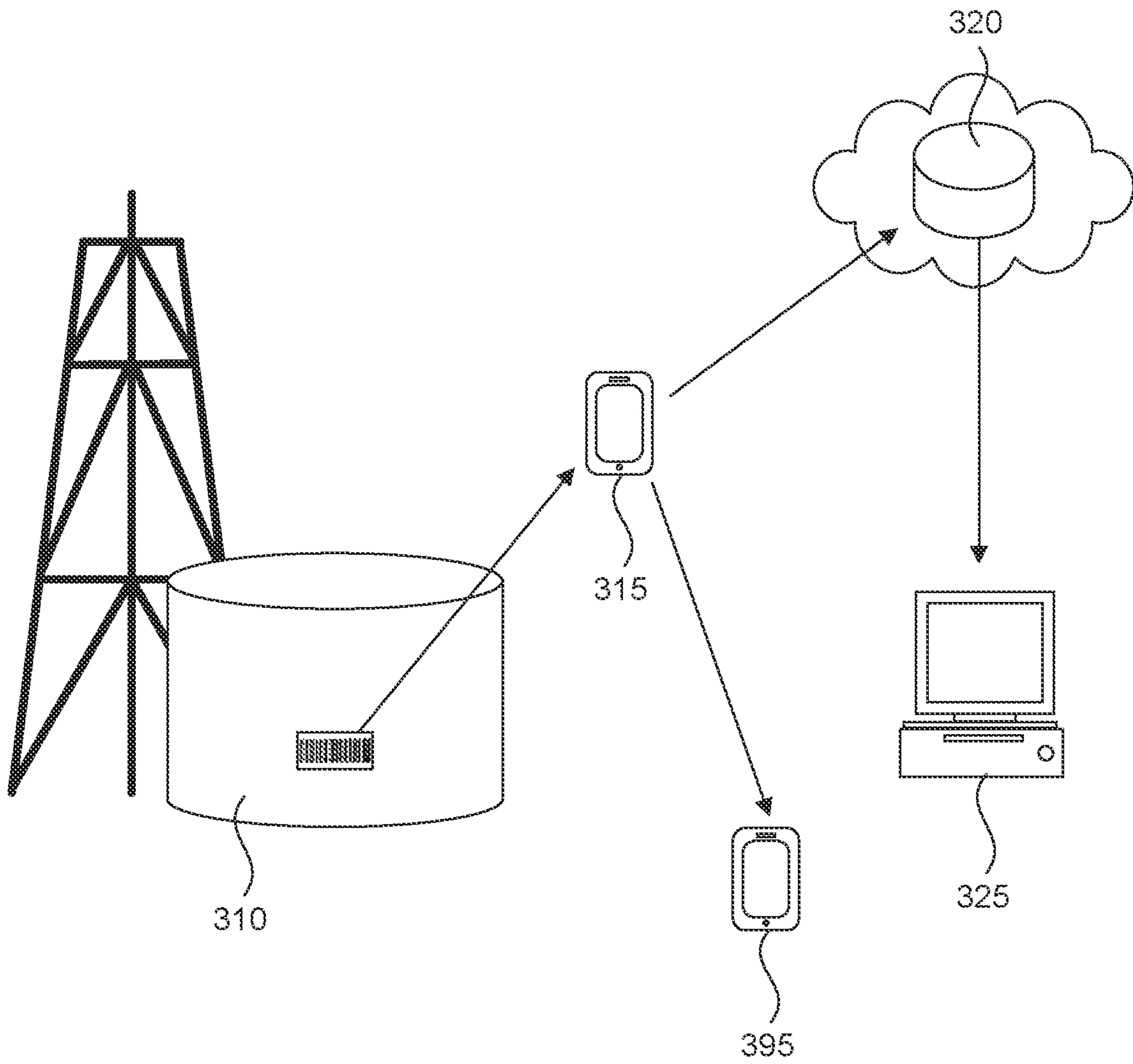


FIG. 3

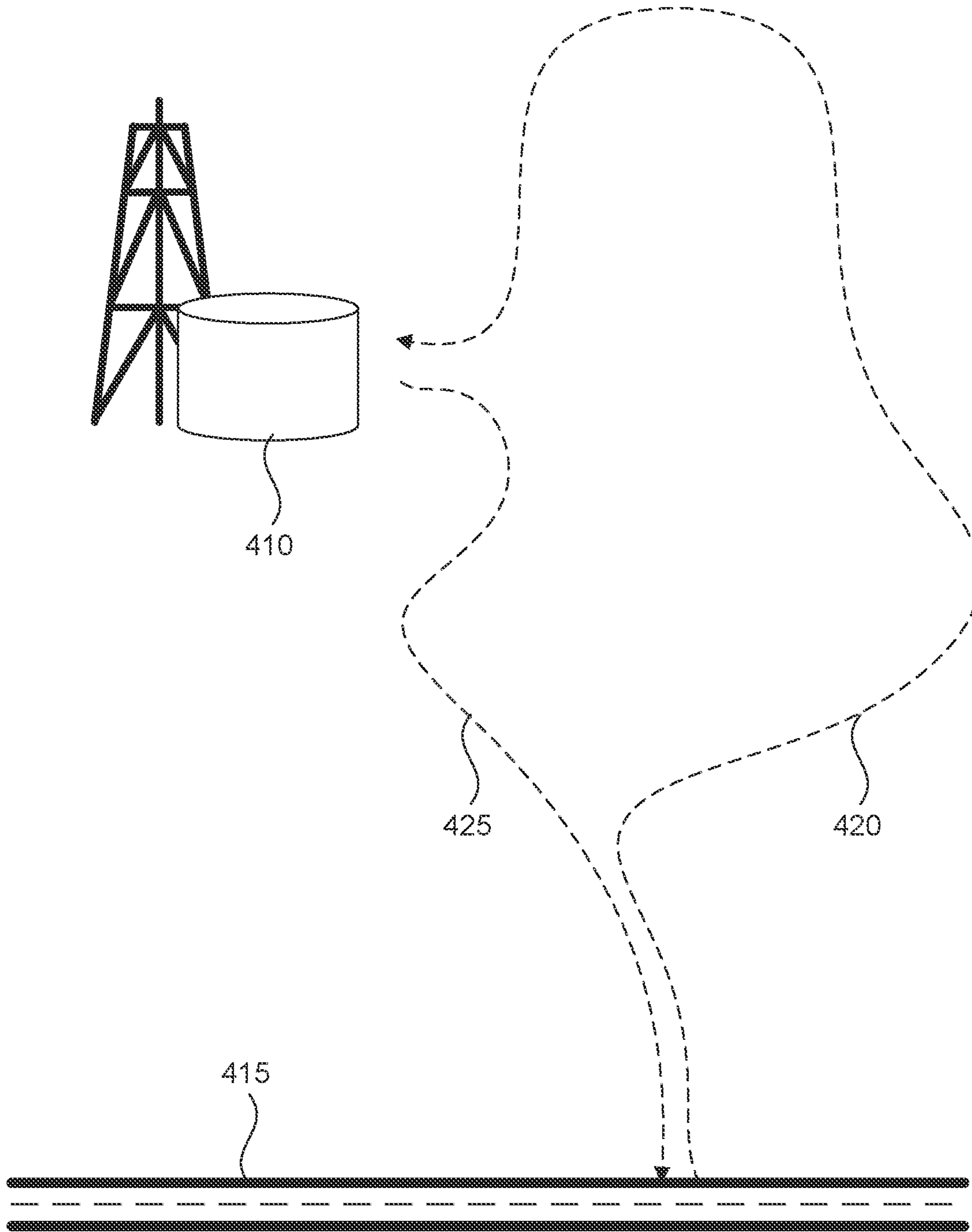


FIG. 4

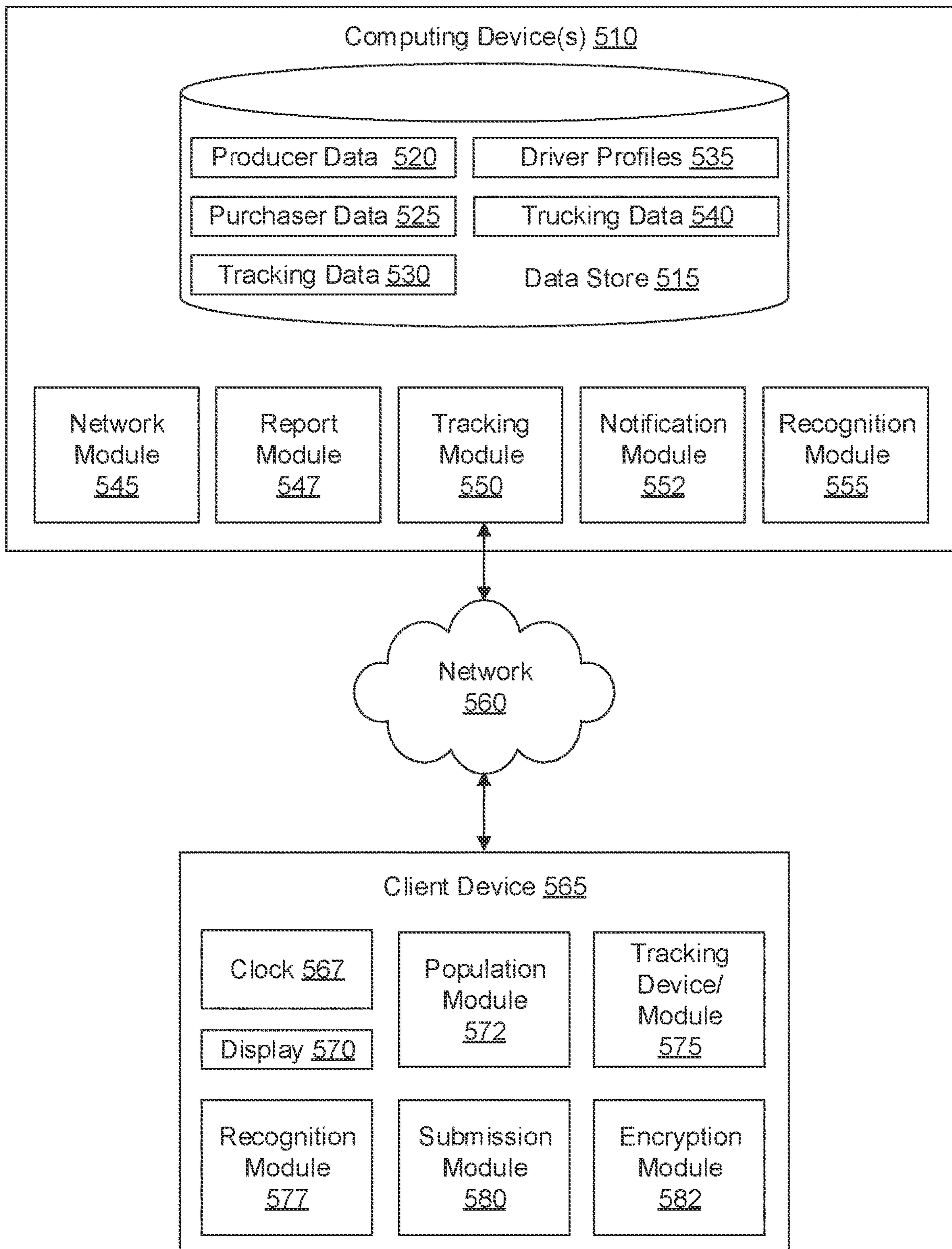
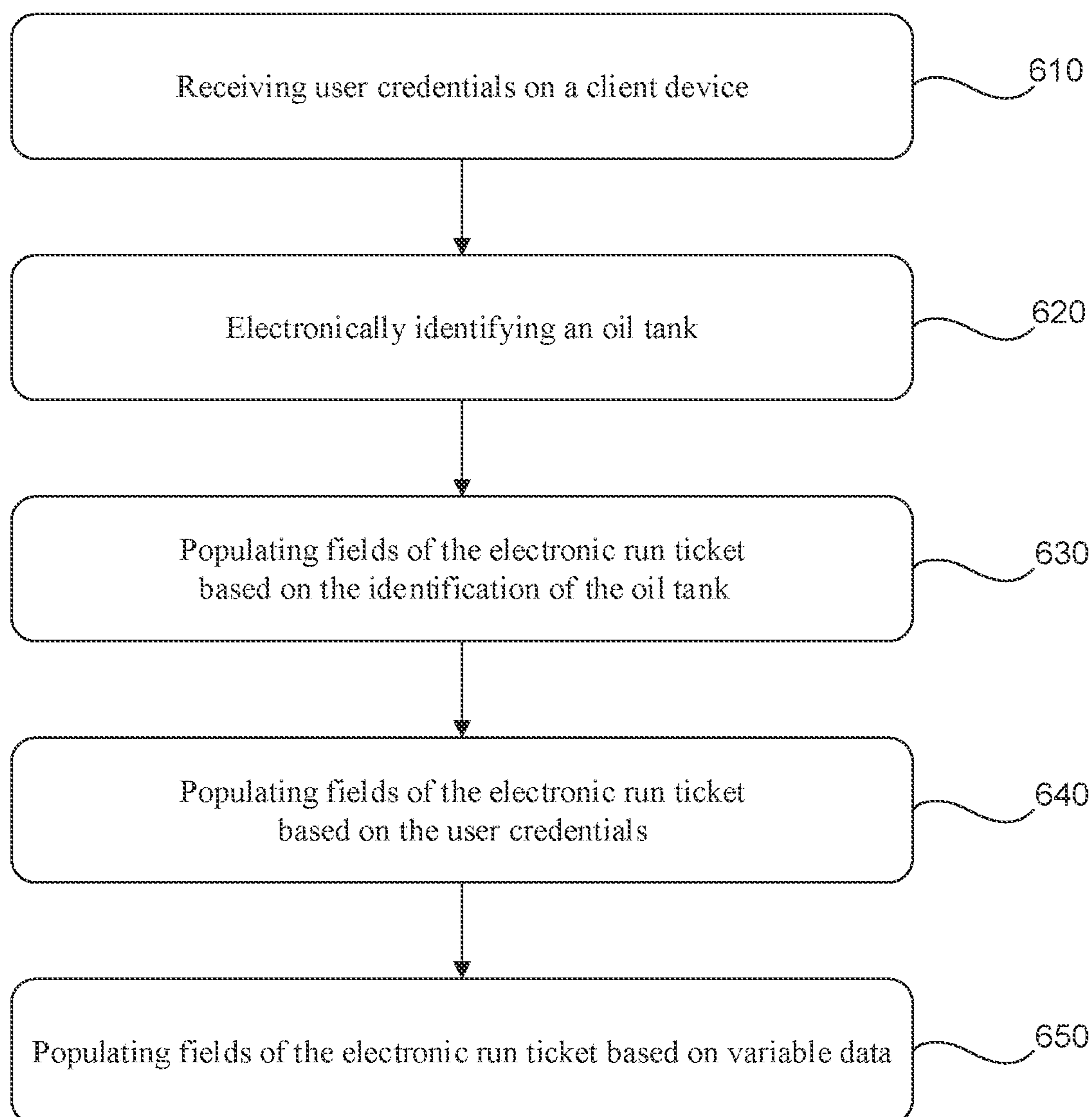
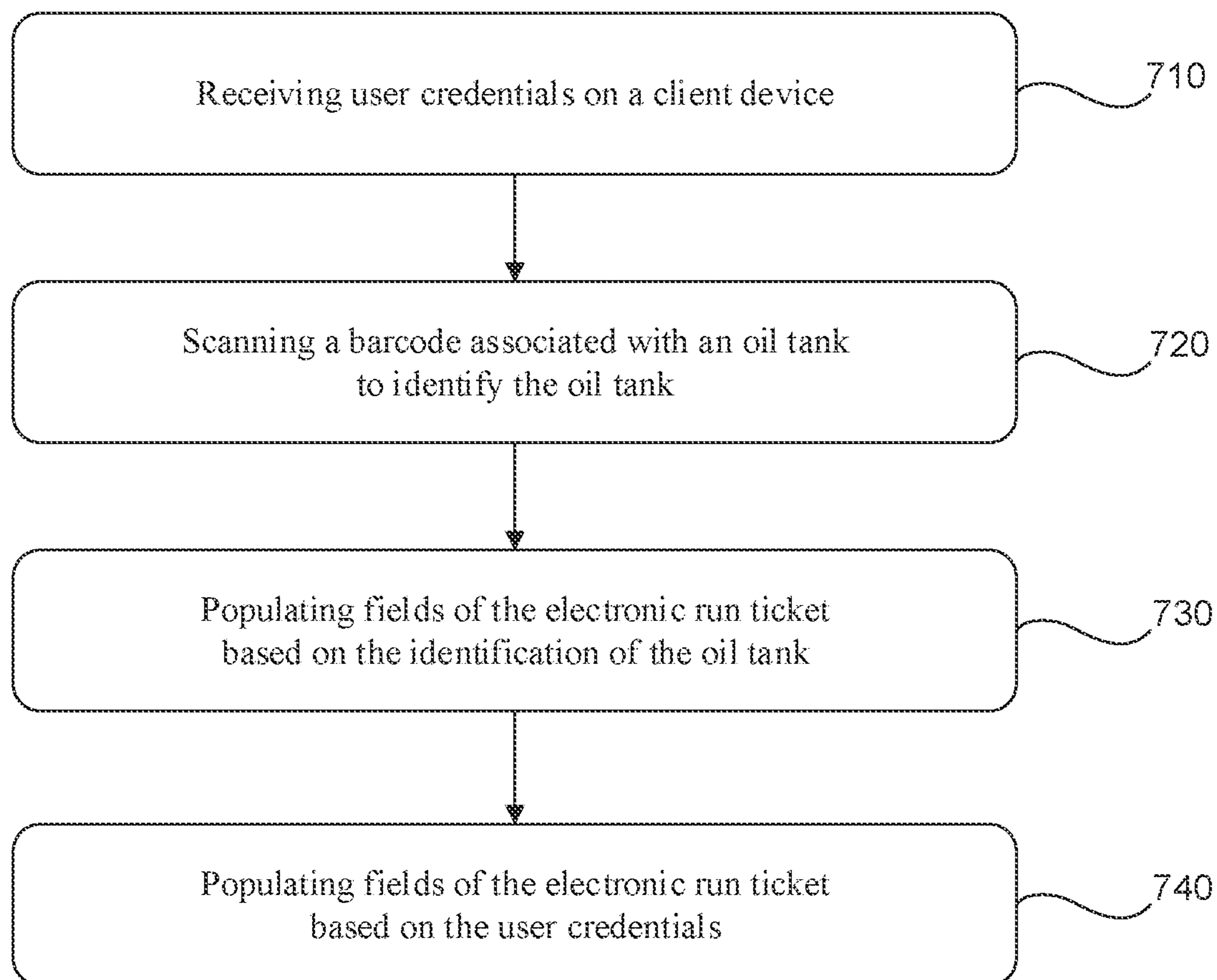


FIG. 5



**FIG. 6**





**FIG. 7**

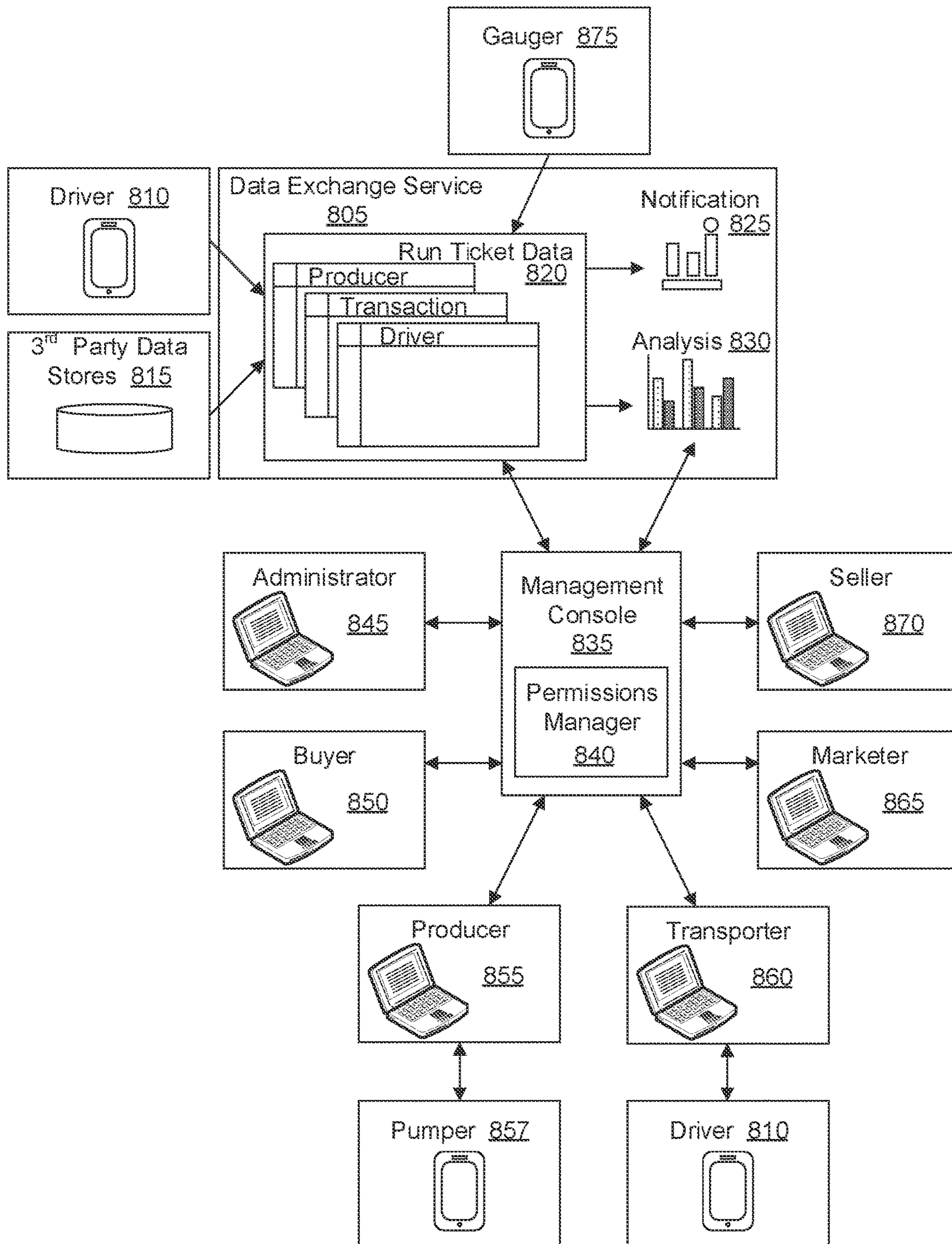


FIG. 8

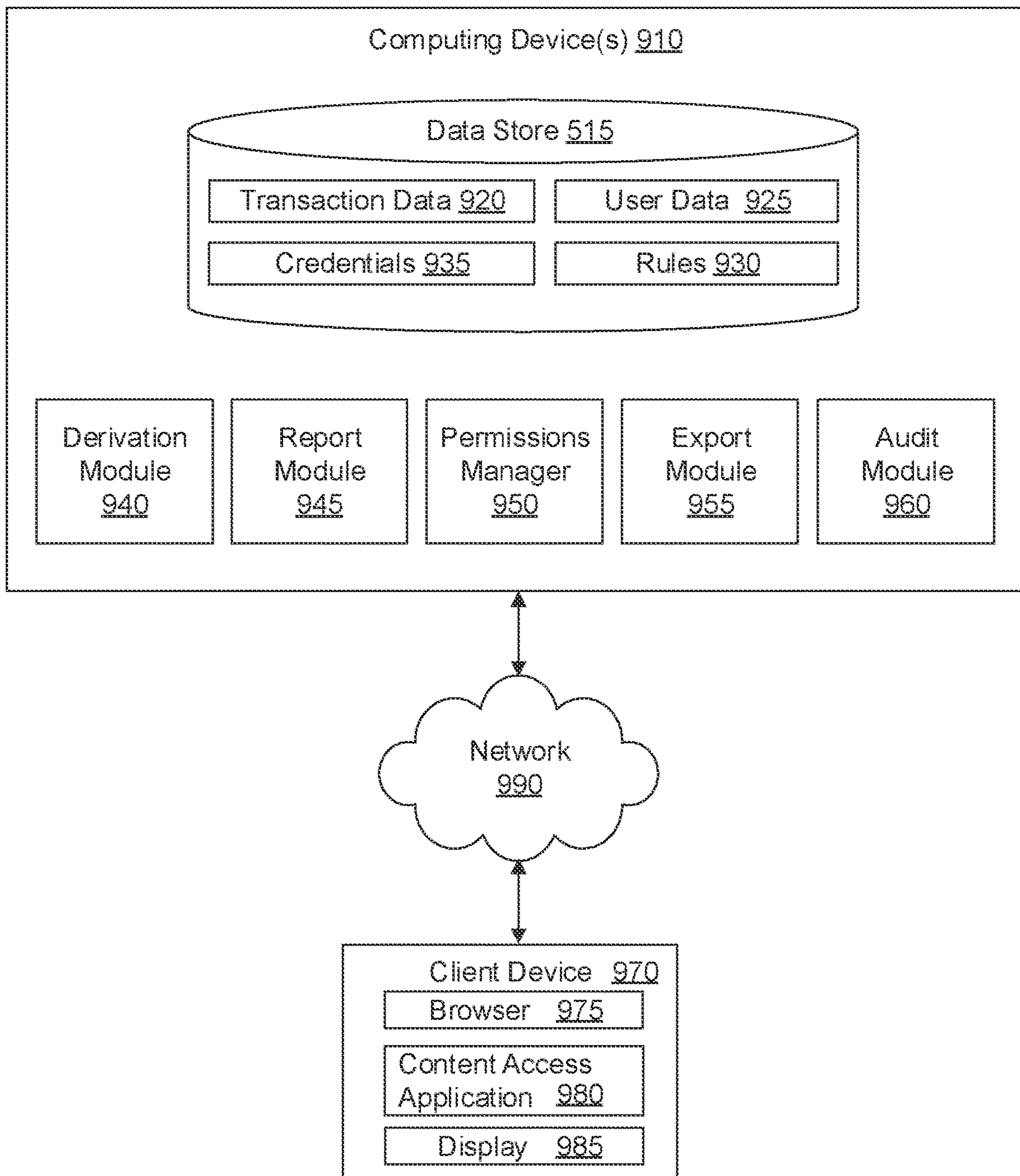
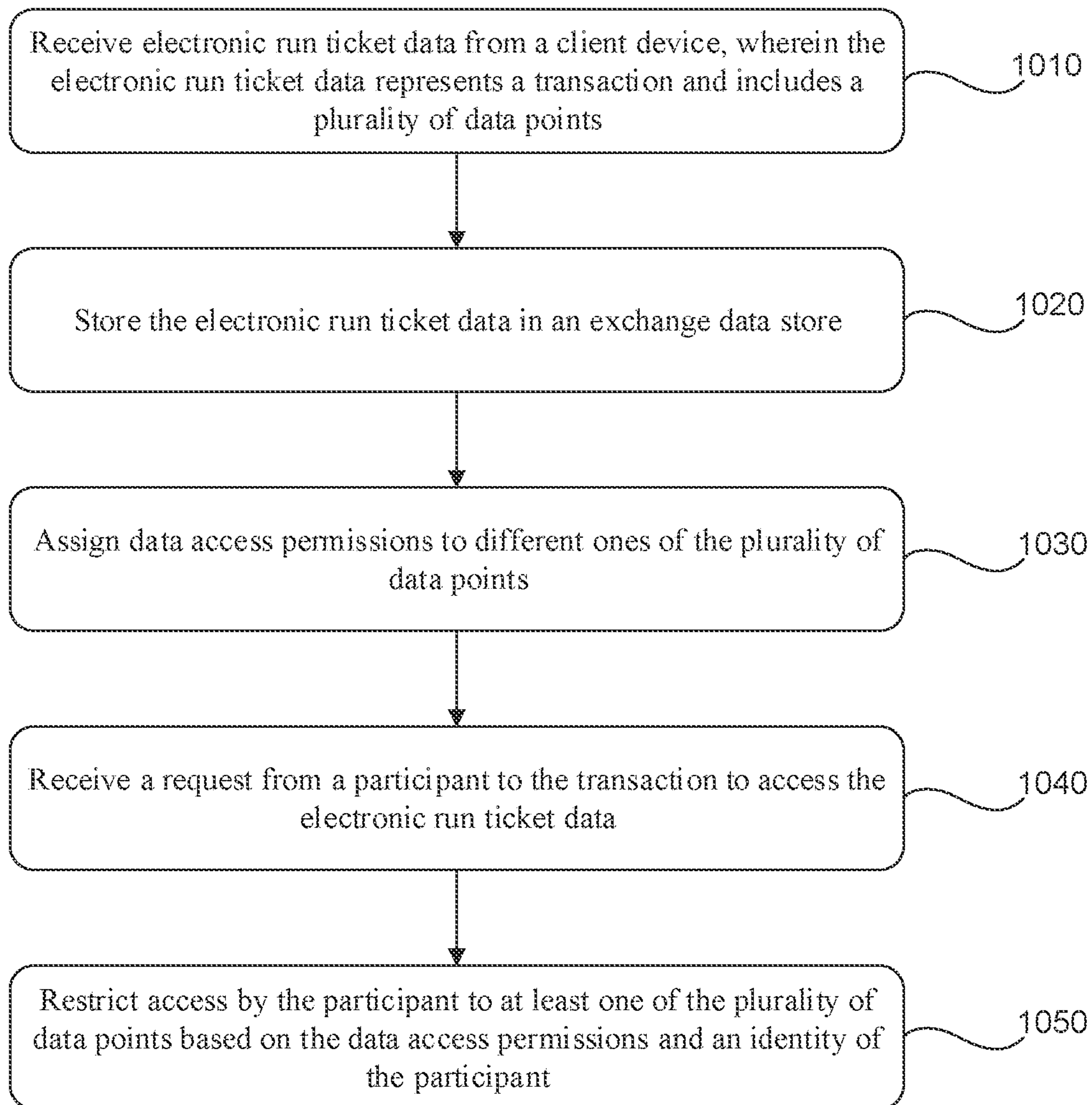
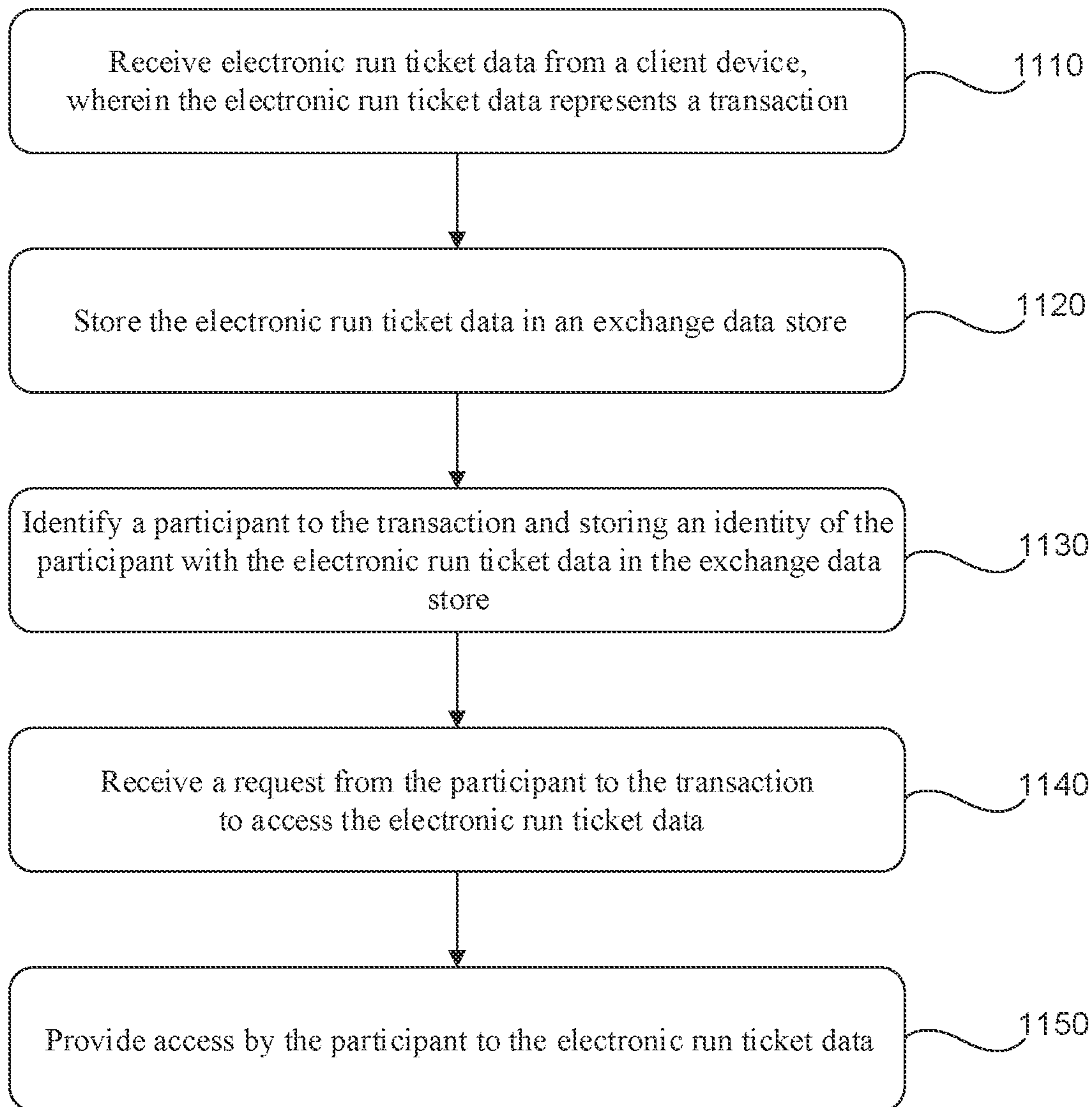


FIG. 9



**FIG. 10**





**FIG. 11**

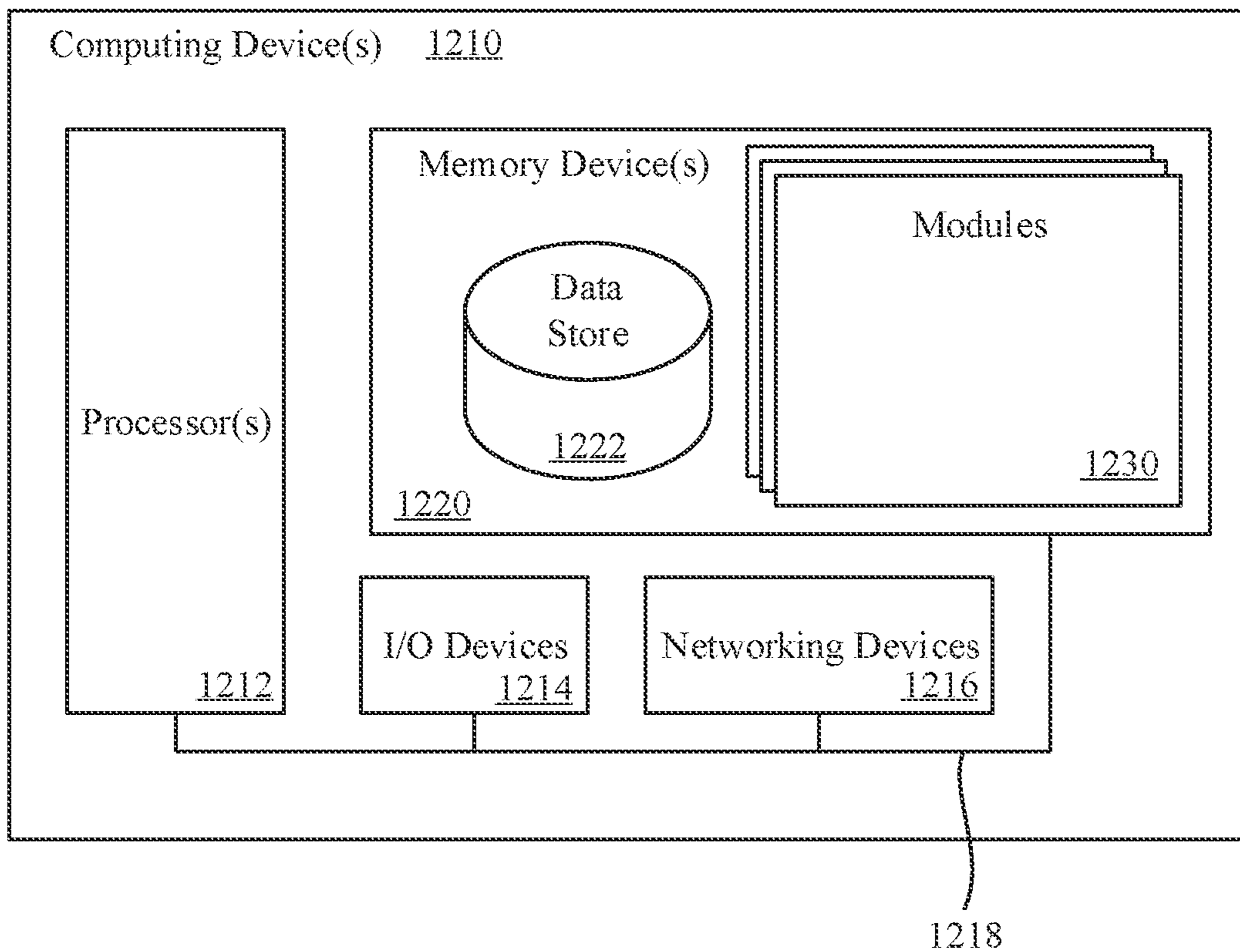


FIG. 12



## ELECTRONIC RUN TICKET

## RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/092,191, filed Nov. 6, 2020, which is a continuation of U.S. patent application Ser. No. 16/158,218, filed Oct. 11, 2018, which is a continuation of U.S. patent application Ser. No. 14/667,589, filed Mar. 24, 2015, which is a continuation of U.S. patent application Ser. No. 14/643,125, filed Mar. 10, 2015, which is a continuation-in-part application of U.S. patent application Ser. No. 14/106,159, filed Dec. 13, 2013, all of which are incorporated herein by reference.

## BACKGROUND

Oil and gas are measured when produced or sold. When fluid is produced from oil and treated, a resultant crude may be stored in a tank or tank battery. A volume of the tank may be known and an amount of oil in the tank may be calculated in terms of a number of barrels (where one barrel is equivalent to 42 U.S. gallons) using height intervals on the tank. The oil may be put into the tank through a top of the tank and sold or dispensed through an opening near a bottom of the tank.

When a truck driver arrives to obtain oil from the tank into a tanker truck, various data regarding the tank and the oil may be notated on a paper document to record the conditions and amount of oil dispensed. For example, a measuring tape or the like may be used by inserting the tape into the tank from the top until the tape reaches the bottom, where an oil level may be determined by viewing the level on the tape. As another example, the oil may be tested to determine characteristics of the oil, such as a gravity of the oil, a temperature of the oil, a basic sediment and water (BS&W) content of the oil, and so forth. A document commonly referred to as a "run ticket" may be used to record the various tank and oil information.

A run ticket is used in buying and selling crude oil. When the ownership or custody of oil changes, a run ticket may be prepared for the receiver and the shipper to record the transaction. A run ticket may refer to evidence of receipt or delivery of oil issued by a pipeline, other carrier, or purchaser. An amount of oil transferred or dispensed from the tank may be recorded on a run ticket. The amount of payment for oil may be based upon information contained in the run ticket. The run ticket may include information such as an opening and closing gauge on the tank, API gravity and temperature of the oil, BS&W of the oil and so forth. A copy of the run ticket may be presented or available to a purchaser, a pumper and a gauger.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration of a conventional run ticket used to record an oil transaction in accordance with the prior art.

FIG. 2 illustrates a mobile device for capturing identification information on a tank and a valve seal in accordance with an example of the present technology.

FIG. 3 is a schematic overview of a system for populating electronic run ticket data at an oil lease using a mobile device, transmitting the electronic run ticket data to a remote data store, and accessing the electronic run ticket data from a workstation in accordance with an example of the present technology.

FIG. 4 is a schematic overview of tracking of a navigation path to and from a destination tank in accordance with an example of the present technology.

FIG. 5 is a block diagram of a system for managing electronic run ticket data in accordance with an example of the present technology.

FIGS. 6-7 illustrate methods for completing electronic run tickets in accordance with examples of the present technology.

FIG. 8 is a block diagram of a data exchange service in accordance with an example of the present technology.

FIG. 9 is a block diagram of a management console in accordance with an example of the present technology.

FIGS. 10-11 illustrate methods for exchanging electronic run ticket data in accordance with examples of the present technology.

FIG. 12 is a block diagram of a computing system for completing an electronic run ticket in accordance with an example of the present technology.

## DETAILED DESCRIPTION

Technology for completing an electronic run ticket is provided. In an example method, user credentials may be received on a client device. A barcode associated with an oil tank may be scanned to identify the oil tank. Fields of the electronic run ticket may be populated based on the identification of the oil tank using a bar code or tank identification number or by use of an installed mobile device database. Fields of the electronic run ticket may also be populated based on the user credentials.

Oil is measured when produced or sold. When fluid is produced from oil and treated, a resultant crude may be stored in a tank or tank battery on a lease. Tank batteries often have a storage capacity of up to several days of production. Each tank in a tank battery is strapped, meaning that the dimensions of the tank are determined and the volume of oil (in barrels) that a tank can hold is calculated at height intervals, such as in 1/4 inch or other intervals.

The oil may enter a tank through an opening at the top of the tank and may be sold or delivered to a tank truck, barge, pipeline or the like through an opening near the bottom of the tank. The delivered oil may be measured by gauging the height of the oil in the tank both before and after delivery of the oil. A tank gauger (who may be the truck driver) may determine the height of the oil in the tank by lowering a steel tape with a plumb bob on the end into the tank. When the tape touches the tank bottom, the tape is withdrawn and the gauger notes the oil level on the tape. Volumes sold may also be determined with the use of meters that capture raw volume data. Such data may be entered into the mobile devices in a similar fashion to the run ticket. This data may be sent to a data exchange service where the data may then be used to calculate net barrels and where the data may be made available to authorized participants to the transaction.

The unit of measure of oil is a barrel, which is 42 U.S. gallons. Before oil is sold, the oil measurement may be recorded in terms of the amount of BS&W contained within the oil. In addition, the API gravity of the oil may be determined for a standard temperature of 60° Fahrenheit (F). Gravity, as used herein, may refer to degree of gravity on the American Petroleum Institute (API) scale and is a measure of the specific gravity or density of crude oil or condensate in comparison to water. API gravity is determined after adjusting measurements made at the actual temperature of the petroleum liquid (i.e., crude oil and condensate) to a standard temperature of 60° F. Crude oil expands as it is



heated and contracts when it is cooled. Different API gravity crude oils expand and contract at different rates at any given temperature; as such all crude oils are temperature corrected before measurement to 60° F. to create a constant when determining volume. On this API scale, the greater the density of the petroleum liquid (or the heavier the liquid), the lower the API gravity. The API gravity of petroleum liquid is useful in determining the sales value of the crude or condensate, because the lighter petroleum liquids (i.e., those with a higher API gravity) typically have different yield values within a refinery, thus affecting the value of the crude when compared with heavier petroleum crude oils (i.e., those that have a lower API gravity).

The volume of oil sold may be converted to standard conditions by using the characteristics of the oil sold. i.e., the gravity, temperature, and BS&W. Thus, in addition to measuring the amount of oil delivered, the oil may also be tested to determine its characteristics. A container known as a "thief" may be used to obtain samples of the oil at various levels in the tank. These samples may be analyzed, such as in a centrifuge, to determine BS&W content, the gravity of the oil, and the temperature. In addition, the temperature of the oil in the tank may be taken both before and after the run. These two temperature readings may be used to correct the volume of the fluid in the tank before and after the run to a standard condition of 60° F. The temperature of the oil from the oil sample may be used to correct the observed gravity at the observed temperature to the API gravity at standard temperature. i.e., 60° F. The BS&W factor may be used to convert gross barrels of oil delivered to barrels net of BS&W content, at API standard.

The BS&W, gravity, temperature, the number of barrels of oil removed from a tank, and the calculations converting the barrels to standard conditions may be conventionally recorded on a paper run ticket to determine the actual volume of oil purchased. The run ticket is a source document for recording the amount of oil sold. FIG. 1 illustrates a conventional run ticket.

When the oil is sold, the gauger representing the buyer, observed by the lease pumper, may measure the oil removed and determine the characteristics of the oil. When the amount of oil removed from the tank and the oil's characteristics have been recorded on the run ticket, at least one or both of the gauger representing the buyer and the lease pumper may sign the ticket.

The data entered on a run ticket is used to determine the volume of oil released from a storage tank or flowed through a meter. The process used to complete a run ticket and determine the net volume from a tank run is described. At the time a tank is installed, it is strapped and assigned a unique number. This number, which is placed on the run ticket, indicates the specific tank from which the oil is released and a strapping table that corresponds with that specific tank and indicates the volumetric characteristics of the tank. This table will be used to convert the feet and inches measurement on the run ticket into a run volume from the tank expressed in barrels.

The level of oil in the tank and the temperature of the oil are measured at the beginning and at the end of the run. For example, the beginning level may be 13'0" and the ending level may be 1'4". Each of these measurements, which are in feet and inches (down to 1/8 or 1/4 inch increments, typically depending on a volume capacity of the tank), may then be converted to a volume in barrels using the appropriate tank table. A thief may be used to collect a sample of the oil. In addition to temperature, BS&W, and gravity, the volume of oil sold may be adjusted to a standard temperature of 60° F.,

and the observed gravity may also be adjusted to a true gravity based on the observed temperature of the sample.

A true gravity may be determined using the observed gravity and observed temperature of the oil during the run. The true gravity, which is the observed gravity corrected for temperature, may be determined using a gravity temperature correction table.

The number of barrels in the tank at the beginning of the run may be adjusted to standard temperature by referring to a table. Using the true gravity and the temperature of the oil at the beginning of the run, a correction factor may be obtained from the table. The number of barrels in the tank at the end of the run may also be corrected for temperature. The second correction factor for the number of barrels in the tank at the end of the run, also taken from the table, may be determined using the true gravity and the temperature of the oil at the end of the run. The factors from the table are multiplied by the volumes of oil before and after the run to get the number of barrels adjusted to standard temperature. The adjusted number of barrels at the beginning of the run and at the end of the run may then be subtracted to obtain a gross measured volume.

The measured volume, now corrected for gravity and temperature, may be multiplied by the correction factor for BS&W to determine the net barrels.

Other items included on the run ticket may include information about the oil lease, information about the truck driver, sales valve seal numbers and so forth. For example, the lease information may include a lease name, lease number, field name, field operator, federal license, location and so forth. The driver information may include the trucking company, the driver's printed name as well as signature, the destination, the destination facility operator, the account for which the oil was purchased, a bill of lading number, and any remarks or comments. The bill of lading may originate with the trucking company and may include or be associated with a description of the product, quantity purchased or hauled, etc., and may have a bill of lading number associated therewith.

The present technology may be used for completing an electronic run ticket, submitting the electronic run ticket, and managing the data from the electronic run ticket after submission. In an example method, user credentials may be received on a client device. A barcode associated with an oil tank may be scanned to identify the oil tank. Fields of the electronic run ticket may be populated based on the identification of the oil tank. Fields of the electronic run ticket may also be populated based on the user credentials.

The user (e.g., truck driver) may be prompted to enter data, such as email address, first name, last name, trucking company and so forth when using the technology. Additionally, the user may be prompted provide a signature. The technology may be implemented, at least in part, as an application or "app" for a smartphone, tablet or other mobile device, for example. Thus, the user data may be input into the mobile device using a touch screen interface, using voice commands, and so forth. For the signature, the user may be asked to sign their name as if signing on paper, such as by using a finger, stylus or other suitable input device. The user may further be assigned a PIN (Personal Identification Number) or be asked to input a PIN to use for security purposes for logging into the application. Information input by the user may be stored locally on the mobile device as well as transmitted to another device, such as a management server.

When the user visits an oil lease to purchase oil, the user may be asked to provide an authentication number or code



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in addition to the PIN to login and register to use the application. The authentication number may be provided to the user, such as by the actual purchaser of the oil or by the trucking company employing the user. In one example, the trucking company may generate the authentication number for a driver when a purchaser, marketer, producer or other entity requests the trucking company to transport oil. The authentication number may be a number specific to an individual truck driver. The user may be prompted to enter the authentication code for registration, along with other user data, such as a name and email address for example. The user may then be prompted to create the PIN and provide a signature for future logins. The user may be presented with terms of use of use of the electronic run ticket technology and may be prompted to sign to accept the terms, such as by signing on an electronic device touch sensitive display screen using a finger or stylus for example. For future access to the electronic run ticket technology, the user may use the PIN created previously, and may optionally use additional information such as a username, email address or other user data.

When the PIN is entered, the electronic run ticket technology may synchronize data between a management server and the device. Data synchronized with the device may be based on permissions associated with the user (as identified by the PIN). For example, based on the permissions and PIN, the device may download lease information, such as a lease operator, legal description of the lease, tank numbers, COC number, county, state, etc. of the lease. Furthermore, the device may synchronize the driver or user name, trucking company and so forth. Based on the authorization code entered the synchronized data may be specific to regional areas.

The synchronized or downloaded data may be pre-populated into an electronic run ticket for subsequent use when the driver arrives at the lease location or may simply be stored in a memory or data storage for subsequent use in populating various fields of the electronic run ticket. For example, when the driver arrives at the lease, the driver may select to create an electronic run ticket, which may generate a run ticket number. The driver may scan a barcode on a tank, for example, and based on the barcode, the electronic run ticket may be populated with data previously or currently synchronized with or downloaded to the device. Each tank in the industry may be associated with a unique number and/or barcode or other identifier. Scanning the barcode may thus accurately identify the lease details and specific tank details.

The driver may be prompted to review the data populated into the electronic run ticket and confirm the accuracy of the data. The driver may scan or enter seal identification numbers, such as sales, production, and/or equalizing valve seal numbers when breaking the seals to dispense oil and/or when re-sealing the valves. The driver may enter a destination for the oil, such as from a drop down list or by typing the destination using a physical or virtual keyboard associated with the mobile device. The driver may further indicate the account for which the oil is being purchased, as well as any remarks, etc.

The electronic run ticket may include a checkbox, drop-down selection menu or other input element by which the driver may indicate whether there was a witness present when the oil was dispensed, such as a representative of the BLM or of a producer. If the driver indicates that the witness was present, the mobile device may open comment box for display for the driver to indicate a name or identity of the witness and the affiliation or role of the witness.

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When data entered into the run ticket has been completed and the driver wishes to submit the data, the driver may again be prompted to enter the PIN and confirm that the data is correct before the data is transmitted to the management server. The data may be transmitted when the PIN is entered and the accuracy of the data is confirmed or may be transmitted subsequently, as will be described in further detail below.

In one aspect, the mobile device may save the electronic run ticket to a storage of the device when the PIN is entered and may ask the user whether to attempt to send the electronic run ticket to the management server. When the electronic run ticket data has been successfully saved and/or transmitted, the mobile device may emit an audio confirmation indicating completion of the process and/or may display a textual or other visual confirmation on a display of the device.

The driver may be enabled to review any of at least the last couple of electronic run tickets submitted. The driver may be permitted to edit at least some fields of the electronic run ticket after completion of the electronic run ticket, such as by editing or adding comments to the electronic run ticket, modifying a destination of the delivery, etc. For example, if the driver is heading to a destination and the destination is changed for whatever reason, the driver may add comments to the electronic run ticket explaining a reason for detainment or redirection of the oil. The driver may then resubmit the electronic run ticket to the management server. Some data may be locked from editing, such as gauge data, for example. Some data may be locked from editing when the electronic run ticket is revisited post-completion of the run ticket, but may be available for editing if the electronic run ticket has not been initially completed or submitted. In other words, some of the data may be available for correction by the driver while on location at the lease. If the driver subsequently determines that wrong data was entered into the electronic run ticket, a new electronic run ticket may be created or a separate corrections ticket may be submitted to a producer, marketer or other entity to modify via the management server. In other words, once the electronic run ticket has been completed, the electronic run ticket represents an original document and at least some portions of the electronic run ticket must remain unedited. Any changes to the original document must be done via a correction ticket process once the ticket has been submitted to the data exchange service described later. Driver comments, destinations, and the like may be considered separate from the original document and may thus be editable.

Referring to FIG. 2, a mobile device 210 is illustrated which may be used to capture images using a camera included with or attached to the mobile device. In this example, the camera may be used to capture images of barcodes, or simply to scan and recognize barcodes. When barcodes are used, the mobile device may optionally be or include a laser barcode scanner as opposed to a camera. The use of barcodes may be to simplify and ensure accuracy of data entry for the oil transaction. Any one or more of a variety of barcode formats or types may be used individually or in combination, such as including, but not limited to: linear barcodes such as Codabar, Code 25—Non-interleaved, Code 25—Interleaved, Code 11, Code 39, Code 93, Code 128, Code 128A, Code 128B, Code 128C, CPC Binary, DUN 14, EAN 2, EAN 5, EAN-8, EAN-13, Facing Identification Mark, GS1-128 (formerly named UCC/EAN-128), GS1 DataBar (formerly Reduced Space Symbology (RSS)), HIBC (HIBCC Health Industry Bar Code), Intelligent Mail barcode, ITF-14, JAN, Latent image barcode,



MSI, Pharmacode, PLANET, Plessey, PostBar, POSTNET, RM4SCC/MX, Telepen, or UPC; and matrix barcodes such as 3-DI, ArrayTag, AugTag, Aztec Code, Small Aztec Code, Codablock, Code 1, Code 16K, Code 49, ColorCode, Color Construct Code, Compact Matrix Code, CP Code, Cyber-Code, d-touch, DataGlyphs, Data Matrix, Datastrip Code, digital paper, Dot Code A, EZcode, Grid Matrix Code, HD Barcode, High Capacity Color Barcode, HueCode, INTACTA.CODE, InterCode, JAGTAG, MaxiCode, mCode, Mini-Code, MicroPDF417, MMCC, NexCode®, Nintendo e-Reader #Dot code, Optar, PaperDisk, PDF417, PDMark, QR Code, QuickMark Code, Secure Seal, SmartCode, Snowflake Code, ShotCode, SPARQCode, SuperCode, Trillcode, UltraCode, UnisCode, VeriCode, VSCode, or WaterCode.

Barcodes represent an example implementation for use in completing an electronic run ticket, but other technologies may also be used in the alternative or in addition to the barcode technology. For example, a low-power wireless technology may be used to communicate data to the mobile device, such as, near field communication (NFC), Bluetooth, RFID, ZigBee, WiFi and so forth may be used. As a specific implementation example, rather than scanning barcodes using the mobile device, the mobile device may be placed near to an NFC equipped structure or device and may obtain the data to populate the data fields via NFC. Any of a wide variety of other technologies not listed here may also be used to facilitate electronic identification of data for use in populating the data fields. Also, while this disclosure primarily describes the mobile device **210** as performing recognition or identification of a tank, seal number, etc., a system may be implemented whereby detected or scanned data may be uploaded for recognition or identification and the identified data may be transmitted back to the mobile device for populating data fields of the electronic run ticket.

In the example illustrated in FIG. 2, a mobile device **210** may be used to recognize a barcode **220** associated with a tank **215** at an oil field. The barcode may be on the tank, on a sign adjacent to the tank or in any other suitable location where the association of the barcode with the tank may be recognized. When the barcode is scanned, information such as the lease name, field name, field operator, federal license number, legal description, county, state, tank number, tank capacity, lease number and so forth may be populated in the data fields. For example, the data may be stored in a data store on the mobile device and a lookup for the data may be performed when the barcode is recognized based on an identifier encoded in the barcode.

Various data fields, such as the open and close depths, tank temperature, BS&W, etc. may be used for data that is to be measured or recorded at the time of a transaction. Because electronic devices or anything that may cause a spark, flame or other source of combustion are not used when measuring the depth of the oil in the tank, some data may be recorded on a piece of paper and subsequently entered into the data fields in the application. Such data may be input manually by the user. However, in one example, a standard paper form may be used for the user to record the data manually. Subsequently, the mobile device may use a camera to capture an image of the standard form, to recognize the data recorded, and to populate the data fields automatically and without manual input of the data into the mobile device. The process of capturing the image, recognizing the data and populating the fields may be performed locally at the mobile device. In another example, the image may be uploaded to a remote server to recognize the data and then delivered back to the mobile device for automatic

inclusion in the data for the transaction. In yet another example, the image may be uploaded to a remote server to recognize the data and the data from the image may be combined with the remainder of the electronic run ticket data by the remote server after the transaction is complete and the electronic run ticket is submitted. In this example, the submitted electronic run ticket may include less data than may be in a conventional run ticket, but the missing data is subsequently combined with the submitted data to complete the run ticket.

When dispensing oil from a tank, various valves may be operated, such as a tank sales valve, a production valve, and an equalizing valve, for example. Seals may be used to secure the valves. A seal may refer to a device, uniquely numbered, which completely secures either a valve or those components of a measuring system that affect the quality and/or quantity of the fluid being measured. Valves may refer to a component of a piping system that may provide access to stored or produced oil, such as fill lines, equalizer or overflow lines, sales lines, circulating lines, and drain lines. Valves are to be closed and sealed after being opened and used. Sealing a valve refers to the placement of a seal in such a manner that the position of the sealed valve may not be altered, or a component in a measuring system affecting quality or quantity may not be accessed, without the seal being destroyed. A run ticket include may include fields to record seal numbers for the valves for operations such as opening, closing, re-opening and so forth. A seal may be recorded and then broken, or broken and then recorded when a valve is opened. Similarly, a seal may be recorded and then used to seal the valve, or used to seal the valve and subsequently be recorded, when a valve is closed.

FIG. 2 illustrates a couple of example seals **225**, **230** that may be used to seal a valve by inserting a narrow end through a hole associated with the valve and looping the narrow end back toward the wider end to affix to the wider end. Any of a variety of types of seals may be used. The seals of FIG. 2 include a barcode **235** printed, stamped or otherwise formed on the seal that may encode the seal number **240** also printed or stamped on the seal. The barcode may be recognized by the mobile device and the encoded seal number may be input by the mobile device into the appropriate data field.

Whether for recording seal numbers, tank identification numbers or other data, the application may enable manual input of the data if the barcode is missing or unreadable. By using barcodes or other suitable technology to populate data in the electronic run ticket, a driver can save a significant amount of time in recording data and verifying accuracy of the data. Additionally, human error due to typographical errors, confusion, letter/number transposition, etc. may be largely eliminated.

As an additional benefit, the recorded data may be uploaded to a management server and accessed or managed by various entities, such as the oil producer, the trucking company, the trucker (i.e., the “user”), the Bureau of Land Management (BLM), the purchaser and so forth. Because the data is electronic and may be electronically submitted, the current method of faxing written forms followed by data transcription from the written copy may be eliminated. Additionally, there is a necessary delay and added degree of complexity for a driver to find and use a fax machine, as well as the introduction of errors due to failed faxes, poor quality faxes, mis-transcription of data and so forth. Information gathered at the lease may be transmitted by the user and received by a cloud server, which may be a part of the electronic run ticket system. The information may then be



fully mathematically calculated/evaluated and corrected for temperature and API gravity. Also, an exact net volume of oil removed from the individual tank may be determined based on the tank's known actual capacity, as may be stored in a data store for the cloud server. It is estimated that accounting personnel used for management of conventional run tickets may be reduced by up to 50% or more through implementation of an electronic run ticket as set forth herein, such as for the reasons set forth above and reasons that may be further described later.

FIG. 3 is a diagram illustrating a flow of data from the oil field to the mobile device to a data store in the cloud to a workstation or other client from which the data is accessed and/or managed. As has been described, software on a mobile device 315 may facilitate scanning of data at an oil lease, such as a barcode on a tank 310, and the data may be subsequently submitted for delivery to a remote server and/or data store 320, as well as to computing devices or workstations 325 for relevant parties, such as via a push notice sent to the producer's pumper or to a mobile device 395 for a relevant party. The electronic run ticket technology may comprise an integrated mobile and secure cloud data storage system. The software may provide real-time data to users and customers. The technology may be designed to accommodate operations in remote areas. For example, while wireless data may be available in an increasing number of areas, the ability to transmit such data in remote areas often decreases for more remote areas. Wireless mobile data connections may be unavailable at some leases. Thus, there may be a delay from when the transaction occurs to when the data is uploaded. To ensure security of the data, the data may be encrypted and generally inaccessible to users of the mobile device, including, in some examples, the originator of the data (e.g., the truck driver). Furthermore, when uploading electronic run ticket data, the data may be encrypted and uploaded to secure servers. The encryption process may restrict the ability of hackers or others to access the data from the mobile device, the wireless transmission, the secure server, or any other portion of the process.

In an example implementation, security for the system may be provided through the use of the authentication code described previously. Each user may be assigned a unique authentication code or key that may be used in the initial activation of the device. The authentication code may be limited to a single use when the mobile device sends a request for authentication. After the device has been authorized, the device may encrypt a unique key for the user and a unique key for the application, as well as a date or time value in UTC (Coordinated Universal Time). Each mobile device running the application may have a unique key. The present technology may allow for some web service methods to be secured (including registration or device activation methods), without having given a user a unique key in advance.

If there is a third party between the mobile device and the internet and the third party is tracking the information sent and received (such as by using a web proxy, for example), the third party may have access to the same information as the mobile device for up to a maximum of 10 seconds, 100 seconds or some other time interval (which may be more or less in actual practice depending on the time provider at the cellular service level).

Each user and application may have a unique key assigned thereto which may be generated randomly. When submitting a request to the management server to synchronize, upload, or download data, the unique key may be encrypted along with a number of ticks (e.g., nanoseconds)

since a particulate date in time in the past. The number of ticks may be a timestamp. The management server may decrypt the request to obtain the key and the number of ticks. If enough ticks have gone by since the request was made, the management server may deny or reject the request. In other words, the 10 seconds, 100 seconds or other interval mentioned above may be a delay of time within which range a difference in the number of ticks will be considered acceptable. For example, when a driver connects to a third-party WiFi hotspot, a malicious entity could log transmitted data and see packet headers in an attempt to perform a replay attack to the management server. The timeout prevents replay attacks from using a same request that the client made.

The services enabling the present technology may be provided using a commercial cloud computing platform. Services, websites and the like may use a secure socket layer (SSL) certificate for increased security.

The technology may include an application framework model by which any number of roles may be created for a given application. Each user may be assigned any given number of roles (Admin, User, etc.) and a single status for application access (Active, Disabled, etc.) for each application within the framework. Each Application that an individual user registers may use a separate and unique key, uniquely identifying each user. Access to any user may be revoked by changing the user's application status to 'disabled'. In other words, even without access to the user's device, access may be revoked and the user may no longer be able to submit data to the server until and unless the application status is changed. Furthermore, when the device attempts to synchronize data with the server, the server may lock the user out of the application on the device until the application status has changed.

In some examples, the server may provide a graphical user interface with information from the submitted electronic run tickets. For example, a details button may be used to provide further information for a given run ticket. Run tickets may be queried by a date range, user identification, purchaser or any other suitable data included in the run tickets. Selecting run tickets on a server side run ticket application may list the current status of any submitted mobile application run tickets. For example, the status may indicate whether a run ticket is expected to be uploaded, whether the pumper has verified the data, whether the run ticket has been delivered to, viewed by, or approved by the appropriate entities, whether any concerns noted in remarks by the driver have been addressed and so forth. The server side run ticket application may provide various aspects of data management. Real-time reports may be available for download in a variety of suitable formats, such as text, CSV (comma-separated values), Exel, HTML or any other suitable format.

Each run ticket may represent a line item in the report. Each line item may report various details for regulatory compliance and management purposes. Various report data may be available to involved parties and the available report data may differ for different parties depending on the extent of information relevant to the party's involvement in the process. Some information may be filtered out by user account type (e.g., producer, transporter, marketer and or level of authority within one of those entities). Some example information included in the report may include lease details, such as: field name, field operator, COC federal license, legal description, lease/pad name, county, state, tank number, tank capacity, tank strapping (STD/Actual), pumper name and signature, and pumper comment with date. The



report may include run ticket details, such as: run ticket number, split ticket number (if applicable), ticket submit date, observed gravity and temperature, calculated net gravity, BS&W % and depth, opening feet/inches/fractions/temperature, closing opening feet/inches/fractions/temp, opening and closing barrels (standard & actual), gross barrels, net-calculated barrels, real-time ticket status (bought/rejected), purchasing company and so forth. The report may further include scanned seal numbers, such as: sales valve open, sales valve close, production valve open, production valve close, production valve equalizing, equalizing valve open, equalizing valve close, equalizing valve equalizing seal numbers. The report may also include transporter details, such as: trucking company, driver name, driver signature, bill of lading number, driver comment at lease, and driver comment at delivery. In one example, a report may be generated that approximates a conventional run ticket using data from the electronic run ticket. Furthermore, because the user signature is stored, as has been described previously, the user signature may be included on the approximation rather than an indication of a digital signature, which may optionally be a method of signing run ticket data according to the present technology. For example, the digital signature may be entered upon receipt of a user PIN or other credentials.

It is noted that while conventional run ticket processing involves manual reference to various printed data or conversion tables, calculations or derivations from recorded data, as well as lookups and other operations, according to the present technology may be performed electronically, such as at the mobile device.

The present technology, with both front-end and back-end systems, may provide benefits to the involved parties. Real time data may be transferred seamlessly between partner entities. Digitized data may be directly transferable into existing data systems. Digital data may be quickly searched, queried and analyzed. Efforts and delays associated with manual entry of paper records may be eliminated. Back office personnel may focus efforts on data trend analysis and anomaly detection instead of manual data entry. The present technology may facilitate error reduction by reducing or eliminating erroneous, missing, or illegible data.

After a transaction has been completed, the mobile and/or server side applications may use notifications for a variety of purposes, such as to: remind the truck driver to upload the data if the upload has not been completed automatically or within a predetermined period of time; to send an alert or push notice to the pumper when the ticket is submitted since the producer's pumper may be required by the BLM to view and approve the transaction within 48 hours; to notify the trucking company or purchaser that the transaction has been completed; and for any of a variety of other conceivable purposes. In some examples, the pumper may manage distribution or use of oil among a plurality of tanks to ensure that tanks do not go completely empty or become full. The use of push notifications may enable the pumper to more quickly respond to changing tank conditions and oil levels, in some cases before the truck driver has even left the lease. Notification may be provided using any of a variety of technologies, such as text message, email, instant message, voice message or other audio notification, and so forth.

Oil producers may bulk import/export lease location and tank information from the server side application. For example, the producer, or any other entity, may download run ticket data for a period of time, such as a week, a month or more, at a time. Data in a cloud-based or remote data store may be automatically transmitted to producers or other

relevant parties at predetermined time intervals or may be automatically downloaded or retrieved by the producers, etc. at predetermined time intervals. For example, data may be downloaded daily at midnight to ensure availability of up-to-date data for the producer's employees when a work-day begins. The cloud data store, or the data available in the cloud data store, may also be integrated or integratable with tax, accounting and other forms of software. This software may be first-party or third-party software. In some examples, rather than integrating the data store with other software, the data available through the data store may be formatted to be usable with any of a variety of software products.

The server side application may allow administrators to enable or disable truck driver access to data, use of the mobile application and so forth from an administrator console. Also, it is noted that while the present technology is described primarily in the context of the oil industry, the technology may be applied to any of a variety of other industries, such as a water hauling industry, for example.

FIG. 4 illustrates a diagram including a main road **415** and a tank **410** on an oil lease removed from the main road. If a driver is unfamiliar with the oil lease, navigating to a particular tank or to a particular location on the lease may sometimes be inefficient and indirect. The present technology may utilize a global positioning system (GPS) device in the mobile device or in communication with the mobile device to track a path **420** a driver may take to reach the tank and/or a path **425** the driver may take to return to the highway. Tracking the path to the tank may be of limited value in instances where the navigation is inefficient and the driver readily recognizes a route to return from the tank. However, in some instances where the path is convoluted or difficult, the route may be tracked to assist the driver in finding the way back from the tank.

Tracking the path from the tank to the highway may be of value to drivers. Often, while a driver may be unsure of the precise destination location, resulting in a less direct route to the tank, the driver may be confident of how to best return to the main road from cues picked up from previously driving to the destination. Thus, the return route may be useful in providing directions to subsequent drivers in reaching the destination. The mobile application may provide navigation instructions in reverse from the path recorded. In this manner, the driver may efficiently navigate from the endpoint of the path (e.g., the turnoff from the main road) to the destination tank (e.g., the starting point of the path).

Even for instances where navigation instructions are provided to the driver for reaching the destination, the return route may still be tracked in order to determine whether this subsequent driver has identified a better or more efficient return route, such as one involving less travel time, less turns or other complexity, and so forth. In this manner a data store of optimal paths may be recorded and identified for use by future drivers.

Referring now to FIG. 5, a block diagram of a system for grouping messages from message senders is illustrated in accordance with an example of the present technology. The system may be implemented on one or more computing devices **510**, such as a server for example, and/or client devices **565** and may be implemented using a network **560**. The system may include a data store **515** and a number of modules **545, 547, 550, 552, 555, 572, 575, 577, 580, 582** for storing and processing electronic run ticket data.

The data store **515** may include, for example, an electronic run ticket data store, driver profiles (including credentials and the like), producer data, purchaser data, truck-



ing company data, tracking data and so forth. While these various bodies of data are illustrated as being associated with a single data store, the data may be stored in a plurality of data stores as may be understood by one having skill in the art. The data in the data store may be structured for suitable display on a client device's **565** display **570** via a browser and/or other content access application, such as in the form of a webpage or website with a graphical user interface for viewing, interacting with, modifying, creating or deleting data.

The term "data store" may refer to any device or combination of devices capable of storing, accessing, organizing, and/or retrieving data, which may include any combination and number of data servers, relational databases, object oriented databases, simple web storage systems, cloud storage systems, data storage devices, data warehouses, flat files, and data storage configuration in any centralized, distributed, or clustered environment. The storage system components of the data store may include storage systems such as a SAN (Storage Area Network), cloud storage network, volatile or non-volatile RAM, optical media, or hard-drive type media.

The server side application may include a variety of modules, such as a network module **545** to identify available communication networks and transmit or receive data to and from client devices. The server side application may further include a report module **547** to generate reports based on data in the data store to provide to the involved parties, with different reports including access to different segments of data, as has been described. The server side application may further include a tracking module **550** to record incoming tracking data for tracking the location or navigation of a driver and to store the incoming tracking data to the tracking data store. The tracking module may also be configured to push the tracking data to connected client devices using the network module to make the tracking data available to the client devices. The server side application may also include a notification module **552** to notify drivers, pumpers, producers and so forth with the notifications that have been described previously.

The client device **565** may include a clock **567** for identifying the time at which a transaction occurs and providing a time stamp to the electronic run ticket application. The client device may also include a population module **572** to populate the various data fields of the electronic run ticket based on received data, such as from scanning, manual input and so forth. The application on the client device may further include an encryption module **582** to encrypt the electronic run ticket data, a submission module **580** to submit the electronic run ticket data over the network, a tracking device and/or tracking module **575** to track a position or navigation of the driver, and a recognition module **577** for recognizing or capturing images for recognition of handwritten data, barcode data and so forth.

The recognition module **555** or **577**, whether on the server side (**555**) or the client side (**577**), may be configured to analyze image, barcode, handwriting, text or other data for recognition to identify characteristics of the data. For example, the recognition module may perform optical mark recognition or optical character recognition operations to identify handwriting or other data captured using a camera of the client device or otherwise input to the client device. In one example, the server side recognition module **577** may be used in a machine learning process. The recognition module may perform machine learning operations on the images and other data, such as in order to better learn handwriting patterns for handwritten data.

Machine learning may be an effective tool for use in optimizing pattern recognition. Machine learning may take empirical data as input, such as known handwriting patterns, for example, and may yield patterns (e.g., predictions) which may be representative of the underlying mechanism or interaction process that resulted in the generation of the patterns. Machine learning systems may take advantage of data to capture characteristics of interest having an unknown underlying probability distribution. Machine learning may be used to identify possible relations between observed variables, such as to recognize complex patterns and to make machine decisions based on input data. In some examples, machine learning systems may generalize from the available data to produce a useful output, such as when the amount of available data is too large to be used efficiently or practically.

Machine learning may be performed using a wide variety of methods or combinations of methods, such as supervised learning, unsupervised learning, temporal difference learning, reinforcement learning and so forth. Some non-limiting examples of supervised learning which may be used with the present technology include AODE (averaged one-dependence estimators), artificial neural network, back propagation, Bayesian statistics, naive bayes classifier, Bayesian network, Bayesian knowledge base, case-based reasoning, decision trees, inductive logic programming, Gaussian process regression, gene expression programming, group method of data handling (GMDH), learning automata, learning vector quantization, minimum message length (decision trees, decision graphs, etc.), lazy learning, instance-based learning, nearest neighbor algorithm, analogical modeling, probably approximately correct (PAC) learning, ripple down rules, a knowledge acquisition methodology, symbolic machine learning algorithms, subsymbolic machine learning algorithms, support vector machines, random forests, ensembles of classifiers, bootstrap aggregating (bagging), boosting (meta-algorithm), ordinal classification, regression analysis, information fuzzy networks (IFN), statistical classification, linear classifiers, fisher's linear discriminant, logistic regression, perceptron, support vector machines, quadratic classifiers, k-nearest neighbor, hidden Markov models and boosting. Some non-limiting examples of unsupervised learning which may be used with the present technology include artificial neural network, data clustering, expectation-maximization, self-organizing map, radial basis function network, vector quantization, generative topographic map, information bottleneck method, IBSEAD (distributed autonomous entity systems based interaction), association rule learning, apriori algorithm, eclat algorithm, FP-growth algorithm, hierarchical clustering, single-linkage clustering, conceptual clustering, partitional clustering, k-means algorithm, fuzzy clustering, and reinforcement learning. Some non-limiting example of temporal difference learning may include Q-learning and learning automata. Another example of machine learning includes data pre-processing. Specific details regarding any of the examples of supervised, unsupervised, temporal difference or other machine learning described in this paragraph that are generally known are also considered to be within the scope of this disclosure.

Example client devices **565** for the system of FIG. **5** may include, but are not limited to, a laptop or notebook computer, a tablet, a cell phone, a smart phone, a hand held messaging device, a set-top box, a gaming console, a personal data assistant, an electronic book reader, heads up display (HUD) glasses, a car navigation system, or any device with a display **570** that may receive and present the data for purposes of the present technology.



The system may be implemented across one or more computing device(s) **510**, **565** connected via a network **560**. For example, a computing device **510** may include a data store **515** and various engines and/or modules such as those described above and such modules may be executable by a processor of the computing device **510**.

The modules that have been described may be stored on, accessed by, accessed through, or executed by a server computing device **510** or a client computing device **565**. The computing device may comprise, for example, a server computer or any other system providing computing capability. Alternatively, a plurality of computing devices may be employed that are arranged, for example, in one or more server banks, blade servers or other arrangements. For example, a plurality of computing devices together may comprise a clustered computing resource, a grid computing resource, and/or any other distributed computing arrangement. Such computing devices may be located in a single installation or may be distributed among many different geographical locations. For purposes of convenience, the computing device is referred to herein in the singular form. Even though the computing device is referred to in the singular form, however, it is understood that a plurality of computing devices may be employed in the various arrangements described above.

Various applications and/or other functionality may be executed in the computing device according to various embodiments, which applications and/or functionality may be represented at least in part by the modules that have been described. Also, various data may be stored in a data store that is accessible to the computing device. The data store may be representative of a plurality of data stores as may be appreciated. The data stored in the data store, for example, may be associated with the operation of the various applications and/or functional entities described. The components executed on the computing device may include the modules described, as well as various other applications, services, processes, systems, engines or functionality not discussed in detail herein.

The client device **565** shown in FIG. **5** may be representative of a plurality of client devices that may be coupled to the network. The client devices may communicate with the computing device over any appropriate network, including an intranet, the Internet, a cellular network, a local area network (LAN), a wide area network (WAN), a wireless data network or a similar network or combination of networks.

Each client device may include a respective display **570**. The display may comprise, for example, one or more devices such as cathode ray tubes (CRTs), liquid crystal display (LCD) screens, gas plasma based flat panel displays, LCD projectors, or other types of display devices, etc.

Each client device may be configured to execute various applications such as a browser, a respective page or content access application for an online retail store and/or other applications. The browser may be executed in a client device, for example, to access and render content pages, such as web pages or other network content served up by the computing device **510** and/or other servers. The content access application may be executed to obtain and render for display content features and messaging features from the server or computing device, or other services and/or local storage media.

In some embodiments, the content access application may correspond to code that is executed in the browser or plug-ins to the browser. In other embodiments, the content access application may correspond to a standalone application, such as a mobile application. The client device may be

configured to execute applications beyond those mentioned above, such as, for example, mobile applications, email applications, instant message applications and/or other applications. Users at client devices may access content features through content display devices or through content access applications executed in the client devices.

Although a specific structure may be described herein that defines server-side roles (e.g., of content delivery service) and client-side roles (e.g., of the content access application), it is understood that various functions may be performed at the server side or the client side.

Certain processing modules may be discussed in connection with this technology. In one example configuration, a module may be considered a service with one or more processes executing on a server or other computer hardware. Such services may be centrally hosted functionality or a service application that may receive requests and provide output to other services or customer devices. For example, modules providing services may be considered on-demand computing that is hosted in a server, cloud, grid or cluster computing system. An application program interface (API) may be provided for each module to enable a second module to send requests to and receive output from the first module. Such APIs may also allow third parties to interface with the module and make requests and receive output from the modules. Third parties may either access the modules using authentication credentials that provide on-going access to the module or the third party access may be based on a per transaction access where the third party pays for specific transactions that are provided and consumed.

Referring now to FIG. **6**, a flow diagram of a method is illustrated for completing an electronic run ticket in accordance with an example of the present technology. The method may include receiving **610** user credentials on a client device. The user credentials may include any of a variety of types of information, such as username, password, PIN, authentication code, email address, name and so forth. The method may include electronically identifying **620** an oil tank and populating **630** fields of the electronic run ticket based on the identification of the oil tank. For example, the oil tank may be identified by scanning a barcode at the oil tank. The method may include populating **640** fields of the electronic run ticket based on the user credentials as well as populating **650** fields of the electronic run ticket based on variable data. For example, the variable data may include time, oil depth, oil temperature, BS&W %, and so forth. Populating the fields of the electronic run ticket with the variable data may include adding a time stamp to the electronic run ticket, electronically receiving data from a centrifuge device, scanning handwritten depth and temperature data, and so forth.

In one example, the method may include detecting an ambient temperature using the client device. Additionally, a temperature of oil in the oil tank may be detected if a thermometer electronically connected to the client device is used to measure the temperature. A thermometer may be integrally formed with the client device or may be electronically coupleable to the client device to enable the client device to detect ambient temperature, oil temperature and so forth. For example, digital thermometers may be coupled to the client device using wired or wireless connections, including but not limited to Bluetooth, WiFi and so forth.

The client device may be configured to calculate a volume of oil in the oil tank based on the temperature and an API (American Petroleum Institute) gravity of the oil. The client device may be further configured to calculate the volume of the oil when the temperature of the oil is different than a



standard temperature for the API gravity of the oil to adjust the temperature to the stand temperature.

In one example, the method may include electronically identifying a legal load capacity of a truck and calculating a volume of oil to remove from the oil tank to fill the load capacity. The client device may store the load capacity of the truck and the volume of oil to remove from the tank or may calculate the volume of oil to remove from the tank based on the load capacity.

The method may include tracking movement of the client device to or from the oil tank using a global positioning system (GPS) that may be integrally formed with the client device or electronically coupled to the client device, wired or wirelessly. The tracked movement of the client device may be stored for display as navigation instructions for a second client device. Additionally, navigation instructions for getting to the oil tank based may be provided to a second device based on the reverse tracked movement of the client device from the oil tank.

In one example implementation, the oil tank, or at least an oil lease, may be identified by comparing a GPS coordinate of the client device to a data store including GPS coordinates of a plurality of different oil tank locations. The oil tank may thus be identified based on the GPS coordinates of the client device. For oil fields with a large number of tanks, particularly with tanks more closely spaced, current consumer grade GPS devices such as may be included in smartphones and the like may be unable to resolve individual tank locations with sufficient accuracy, but more general information about the lease as a whole may be identified and populated based on the GPS coordinates. Additionally, as GPS device accuracy improves, and the ability to resolve individual tank locations becomes feasible, the identification functionality may be extended to identify individual tanks based on the GPS coordinates. Also, the client device may receive identification of an oil tank through a user interface after resolving a lease or oil field identification. For example, when the GPS device identifies that the client device is at a particular lease, the user may be prompted to select a tank from which oil will be drawn from a list of tanks available at the identified lease.

Other example implementations for identifying the oil tank may include scanning a bar code on the oil tank using the client device, receiving input of an identification number of the oil tank to the client device and comparing the input to a data store including identification numbers of a plurality of oil tanks to identify the oil tank, detecting the identification of the oil tank using any of a variety of radio wave communications (some examples of which have been previously mentioned, including NFC, RFID, ZigBee and so forth), as well as through the use of other technologies.

In some instances, an individual oil tank may not include sufficient oil to fill a truck load capacity and oil may be drawn from a plurality of tanks. In such an example, the method may include associating run tickets for a plurality of oil tanks when a truck leases oil from the plurality of oil tanks.

Referring now to FIG. 7, a flow diagram of a method for completing an electronic run ticket is illustrated in accordance with an example of the present technology. The method may include receiving **710** user credentials on a client device, scanning **720** a barcode associated with an oil tank to identify the oil tank, and populating **730**, **740** fields of the electronic run ticket based on the identification of the oil tank and the user credentials. Additionally, the method may include scanning barcodes on valve seals to enter opening, closing, and equalizing valve seal numbers.

In some examples, this or other methods described herein may be implemented wholly or partially as computer readable program code executed by a processor and the computer readable code may be embodied on a non-transitory computer usable medium.

Referring now to FIG. 8, a block diagram of a system is illustrating for facilitating a run ticket data exchange service **805** for use by participants to transactions. For example, FIG. 5 illustrated the use of a server accessible over a network to transmit and receive data relevant to oil transactions, and particularly to transactions which may involve data from electronic run tickets. In FIG. 8, a data exchange service **805** is illustrated for collecting, managing and analyzing data from one or more data sources. Run ticket data **820** received from a user, such as a truck driver **810**, via a mobile computing device, such as a smartphone for example, is one example source of data. Another example source of data may be data input by a gauger **875**. The gauger **875** may be a representative of the buyer, transporter or producer. The gauger **875** may open a tank and test oil quality and quantity for each tank. For example, the gauger **875** may perform this operation before and/or after a driver **810** has extracted oil from a tank. The data provided by the gauger **875** may be used to verify accuracy of data supplied by the driver **810**. The Data Exchange Service **805** may be configured to compare the data from the gauger **875** with the data from the driver **810** and may determine a degree of correlation at analysis **830**. When the data does not sufficiently correspond, such as when the degree of correlation is outside of a predetermined threshold of error or acceptability, a notification **825** may be provided to the parties to the transaction to resolve the issue. The notification **825** may be sent based on permissions, which may be determined based on involvement with particular aspects of the transaction. For example, the notification **825** may be sent to the buyer, transporter and producer, substantially simultaneously and may not be sent to other parties.

Additional data may be received from other sources. For example, third (3<sup>rd</sup>) party data stores **815** may also provide a source of data. These third party data stores **815** may include, for example: data which is publicly available such as from a government report on oil production, prices, taxes, or the like; or data from buyers **850**, sellers **870**, marketers **865**, producers **855**, transporters **860** or the like who may be participants to transactions. The third party data stores **815** may be electronically accessible by the data exchange service **805** or may proactively submit data to the data exchange service **805**. The data from the third parties may be correlated with run ticket data **820** to provide additional analysis, reporting, forecasting or other utility. The third parties may opt to maintain confidentiality of the data, such as to use the data in connection with the run ticket data to generate private reports which are not accessible to other parties. The third parties may opt to publish or make accessible either the data from the third party data store or reports generated based on the data. For example, the data or reports may be made available to other parties for a fee. In one example, the data exchange service may analyze, organize, collate, correlate, interpret, forecast or manipulate data based on data available from a plurality of sources, or may make the data from the plurality of sources available to parties, such as transaction participants, for use in performing such operations on the data.

FIG. 8 illustrates that the data exchange service **805** may include run ticket data **820** relevant to the producer, the driver, the transaction, etc. to list a couple of examples. The run ticket data **820** may optionally be correlated with



additional data from the producer, the transporter, etc. as has been described. Different portions of the run ticket data **820** may be made available to different parties and/or used for various purposes, such as analysis **830**, notifications **825**, report generation and so forth. For example, reports may be generated based on data in the data store to provide to the involved parties with various reports including access to different or appropriate segments of data, as has been described. The data exchange service **805** may provide notifications **825** to administrators **845**, buyers **850**, producers **855**, transporters **860**, marketers **865**, sellers **870**, government entities or the like based on data included in the run ticket data **820**. For example, notifications **825** may be made that run ticket data **820** was uploaded, that the run ticket data **820** included errors such as incorrect, inconsistent or missing information, that oil has been removed from a tank or delivered to a buyer, and so forth. Notifications **825** may be provided to notify parties that reports are available, that analysis of data has been completed, that other parties have contributed additional data or modified existed data and so forth.

Access to the data exchange service **805** may be regulated by a management console **835**. For example, the management console **835** may include a permissions manager **840** configured to permit access to appropriate segments of data based on identity, credentials or the like. Similarly, the permissions manager **840** may deny access to other segments of the data based on the same identity, credentials, etc. In other words, rather than providing blanket access to all data by all parties, access may be restricted based on predefined policies, whether the data is relevant to a requesting party, whether the requestor has paid an appropriate fee for access to additional data or any of a number of other factors.

In one example, participants to a transaction may assign permissions to access data to others (such as employees) from within the permissions available to that participant. For example, within the scope of the permissions provided to a producer **855**, the producer **855** may assign permissions to the producer's field representative (i.e., pumper **857**) to access at least some of the data available to the producer **855**. A set of permissions for participants may be governed by law, necessity, involvement in particular aspects of a transaction, predefined rules or the like, and such definition of the permissions set may be at the data exchange service **805**. The participants may define sub-rules for sub-participants (e.g., pumper **857**, driver **810**) for a subset of permissions. In another example, the data exchange service **805** may define the subsets of permissions for sub-participants. The participants may simply assign a role to a sub-participant, where the role is defined by the data exchange service **805** and is associated with the subset of permissions appropriate for that role.

Referring to FIG. 9, a more detailed view of an example system, which may represent a management console, as part of a data exchange service is illustrated in accordance with an example of the present technology. The management console may be implemented on one or more computing devices **910**, such as one or more servers, for example. The servers may network accessible or "cloud" based servers. The server(s) may be a computing instance, and the computing instance may be implemented using a virtualization computing environment in a service provider environment, which may include a virtual distributed computing system with a virtualization layer executing on a hardware substrate layer. The hardware layer may include a plurality of physical computers, servers or processing nodes. The virtualization

layer (e.g., hypervisor) may provide a platform on which computing instances may be created. In other words, the computing instances may execute on the hardware layer by using the platform provided by the virtualization layer.

The system may include one or more data stores **915** or be in communication with one or more data stores including run ticket and other transaction related data, and may be accessible by various interested parties. In other words, the system may operate as a clearinghouse exchange or data warehouse for run tickets where in those parties involved in an individual transaction or a group of differing individual transactions may access pertinent data, whether those parties be producers, transporters, marketers, end markets or the like. These parties may access the same stored information relative to one or more transactions or may access different sets of information relative to the one or more transactions, where the different sets of information may be non-overlapping, partially overlapping, or where one set may be a subset entirely subsumed within another superset.

The system may be configured to format the available data, calculate data from the raw run ticket data, derive additional data such as through calculations, forecasts or the like, and so forth. In one example, the data available in the data store may be made available in a raw format to parties involved in the transaction or in a format where the data is further calculated into a resultant state, such as "net barrels" for example. Provision of the raw data or calculations or the like based on the raw data may enable transaction participants to reconcile accounting matters with other transaction participants. For example, two involved parties may have access to and view same or similar relevant data which may be made available to both parties at the same time. The system may further facilitate reconciling of perceived errors or changes to be made, as well as payment or offer of other consideration to fulfill obligations. All parties may have access to portions of the transactional information to which these parties may be entitled to receive within the transaction and may have access restricted to information that would be proprietary to other parties within the transaction or that would involve transactions with other third parties.

The data store **915** may include various relevant points of data, many examples of which have been described previously. Some examples illustrated in FIG. 9 include transaction data **920**, such as data entered into an electronic run ticket via a mobile device, as well as additional data such as may be gathered by the mobile device (e.g., location data), data that is submitted by third parties relevant to the transaction, and so forth. The transaction data **920** may also include calculated or derived data which is calculated or derived from other available data. The data store **915** may also include a user data store **925** for storing user profile data, account data, and so forth for the various parties that may access the system. A credentials data store **935** may be used to store credentials for the parties to ensure secure access. The credentials data store **935** may include flags, indicators or the like representing data segments with which the credentials are associated, or rather which indicate which data segments the user with the supplied credentials may access. Data segments not associated with the credentials may not be provided to the user who supplies the credentials.

The data store **915** may further include a rules data store **930**. The rules data store **930** may include rules or policies related to data storage, access, management, maintenance, and so forth. The rules may further define how data is to be analyzed, what calculations are to be made, under what conditions users are to be notified, and so forth. The rules data store may also define access conditions associated with



credentials. For example, the flags or indicators associated with credentials may indicate that an account is a particular type of account or belongs to a particular class of party. Different types of accounts may be provided for different roles, such as a driver, an accountant, a manager and so forth, and the rules may define what data is accessible according to the role indicated by the account type. A class of party may relate to which party is associated with the account. A transporter account may have different access than a seller account, which may have different access than a producer account, and so forth. Further, the rules may specify additional access constraints, such as time constraints for when the account may be accessed, location constraints for a location from which the account may be accessed (where location may be a physical, geographical location and/or may refer to a device, IP (Internet Protocol) address or the like which is used to access the account), and so forth.

The system may be configured to calculate data using a derivation module 940, where in this example the derivation may refer to a derivation of data through calculation. Derivation may refer to forecasts or other interpretations of the data as has been described. While various calculations have been described previously, a brief description of some example calculations follows. For example, tank liquid levels and the volume of liquid extracted from the tank may be determined or calculated by the derivation module using the actual tank strapping tables (or in some cases, standard tables) that provide previous determined volumes at given liquid levels within the tank. By calculating the difference between the measurement level at the start of the unloading process (opening tank reading) and the measurement level at the end of the unloading process (closing tank reading) the derivation module may calculate the amount of liquid extracted from the tank as a volume of liquid. From that resultant volume an allowance may be made for a predetermined independent test for the BS&W (basic sediment and water) content. This BS&W calculation may be expressed as a percentage of the total BS&W content of the crude oil contained in the tank. The percentage of the crude oil volume that is calculated to be BS&W may then be excluded from the resultant volume derived from the tank level calculations to calculate the actual gross volume (i.e., the volume before consideration of temperature and gravity).

The observed API gravity and temperature may be corrected by the derivation module 940 to account for the temperature at which petroleum products are measured for volume determination (60 degrees Fahrenheit) and quality determination (API gravity). The resulting calculation may represent the net barrels of oil that have been extracted from the lease crude oil tank by the truck and thus may represent the exact sales volume and quality of the transaction. The data resulting from these calculations by the derivation module 940 may become legal documentation for the transaction and may be available to or reported to various interested entities, such as participants to the transaction, government entities and so forth.

The derivation module 940 may further make calculations of how much time has elapsed for a transaction to be completed by analyzing time stamps collected during a transaction at various stages during the transaction. Time efficiencies may be calculated per transporter, or per driver of the transporter. Identification may be made of portions of the transaction that were not completed timely. Areas of efficiency may be identified to assist transporters or drivers in focusing on less efficient time uses in the transaction.

Other time aspects may also be calculated, such as the elapsed time for completing payment, for responding to inquiries, and so forth.

Different data may be disseminated to different parties. Specifically a permissions manager may be utilized to differentiate and distinguish among parties to specify which data is accessible to which party. The raw data, or any derivatives thereof, may be accessed, or data may be presented in a report prepared by a report module. Some example descriptions of transaction participants and the data to which these participants may be granted access follow.

Producers (i.e., oil producers) may access run ticket information gathered at the production location. Producers may also access subsequent calculated values that indicate the corrected volume and quality of the oil. Producers may desire calculations to determine a number of net barrels for each transaction in order to understand for how much volume the producer should expect payment by the marketer, and such calculations may be performed by the present system. The calculations may be performed uniformly for each producer, with the same information being simultaneously available to marketers.

Transporters physically collect the oil from the lease location and deliver the oil to the destination as instructed by the marketer. The transporter may work for the marketer and may thus share the information about the lease with the producer and the information about the destination with the end market. Accordingly, the transporter may access information from both the production location (i.e., the producer) and the delivery location (i.e., the buyer). Transporters may desire calculations to determine the volume of oil upon which to bill freight.

Since the transporter works for the marketer (whether an independent marketing company or as part of a production company or end market) and the marketer is responsible for paying the producer and the transporter as well as collecting payments from the end market, the marketer may receive run ticket information relating to the transaction from the lease to the delivery side of the transaction. Marketers may desire calculations to derive a number of net barrels for each truck transaction, thus enabling the marketer to know for how much volume to expect to pay the producer. The calculation may also enable the marketer to determine how much oil to expect to have delivered to the end market and for what volume to expect the transporter to be billing for freight charges.

The end market (e.g., refiners, pipelines or additional marketers) may generally receive the information gathered from the run ticket pertinent to the volumes and quality delivered to a receipt point, as well as information relative to the company supplying the oil and the transporter delivering the load of oil. This information may include, for example, the lease name but without including the name of the producer or the location of the lease. In some examples, end marketers may have access to the entire run ticket information. In such a case, the end marketer may also access the calculations made for a number of net barrels for a truck transaction.

A marketer's truck load volume purchased from a producer should closely approximate or match with what the producer claims to have sold that marketer. Also, it may be valuable for the marketer to know that the transporter delivered this same volume to the marketer's end market and that the transporter charges the marketer for this same volume. Likewise, the marketer desires to be able to charge the end market for that same volume. As such all parties in the transaction match up each transport load transaction



(e.g., truck transaction, as referred to previously) at the end of the month so that the volumes match up with the other parties in the transaction. Rather than having the various parties separately perform the calculations to ensure that volumes and the like match for the transactions within a defined period of time, the present system may gather the relevant transaction data from each transport load transaction. Much of this data may be gathered using an application, or “app”, on a mobile device, which transmits the data to the system. The data may be stored, made accessible, analyzed, reported, and so forth from the system. In one example, raw data may be used to calculate resultant values that satisfy industry standards. Accordingly, the present technology may enable parties to transactions to simply and easily net out transactions with the other parties in the transaction according to industry standards.

The present technology may enable very rapid to near instantaneous availability and calculation of data, particularly as compared with conventional methods presently employed. For example, current parties to transactions generally do not expect to receive a complete set of paperwork from transactional partners until around the 10th business day into the month following the transaction(s). The data is then manually entered into the party’s system. The processing of the data may continue until about the 18th day of the month following delivery. With the present technology, the participants may have volumes and any other calculations performed automatically by a trusted third party with all participants receiving data based on same calculations at a same time at a defined time following the transaction. For example, the data may be provided to the parties on the first day of the month following the month of delivery. The system may significantly expedite the process for all parties involved and also significantly reduce the work involved in transacting business between parties. The system may further provide various other advantages which are described herein.

Some additional advantages and features of the present technology will be described. The present technology may significantly reduce the chance of transposition of numbers and of keying errors when data is entered into the various systems of parties to the transaction. Use of independent, impartial, third-party calculations provides assurance to participants in the transaction of the accuracy of the transaction values. The present technology may provide real time or near real time access to production lifting information for production companies. The data made available through the present system may enable various manipulations of the data. For example, the data may be sorted by specific lease, by specific purchaser, by specific transporter or about any other data identifier that is present with the data. The present technology may assist the users of the system in various ways. For example, marketers may be enabled to determine transit loss from the lease location to the end market, producers may view or be notified when a transporter has actually picked up a load from a specific lease and what the quantity and/or quality of that oil is, or a marketer may determine what volume of oil they are actually getting from a specified lease or number of leases. The system may include an export module **955**. The export module may enable parties with the appropriate credentials to export data from the system into the parties’ own systems, which may be proprietary.

Producers often retain copies of run tickets for which the producer is a party to a transaction for up to eight years, such as to comply with regulatory, financial, or other concerns. However, maintenance of run tickets for such a period may

involve large amounts of physical storage space and/or employment of one or more employees to manage the storage of the run tickets or to enter the individual tickets into a data base, such as by scanning, manual entry or the like. The present technology may reduce costs by eliminating a need for physical storage space and by eliminating a need for additional employees to manage the paperwork.

The system may include an audit module **960**. Participants to transactions may be selected at times by a government entity for an audit. Preparation of forms, assemblage of data, performance of calculations, submission of audit documents and the like may be performed by the audit module **960**. The system may thus reduce or eliminate various of the complexities presently associated with audits, while also reducing time and expense involved in complying with audits.

Client devices **970** may access data, content pages, services and so forth via a computing instance or server in a computing service provider environment or one or more computing instances or clusters, over a network **990**. Example client devices **970** may include, but are not limited to, a desktop computer, a laptop, a tablet, a mobile device, a television, a cell phone, a smart phone, a hand held messaging device, a personal data assistant, an electronic book reader, heads up display (HUD), or any device with a display **985** that may receive and present the message content.

The system may be implemented across one or more computing device(s) connected via a network **990**. For example, a computing device may include a data store and various engines and/or modules such as those described above and such modules may be executable by a processor of the computing device. The system may be implemented as a plurality of computing nodes or computing instances, each of which comprises at least one processor and a memory, where the computing nodes are configured to collectively implement the modules, data stores and so forth.

The modules that have been described may be stored on, accessed by, accessed through, or executed by a computing device. The computing device may comprise, for example, a server computer or any other system providing computing capability. Alternatively, a plurality of computing devices may be employed that are arranged, for example, in one or more server banks, blade servers or other arrangements. For example, a plurality of computing devices together may be a clustered computing resource, a grid computing resource, and/or any other distributed computing arrangement. Such computing devices may be located in a single installation or may be distributed among many different geographical locations. For purposes of convenience, the computing device is referred to herein in the singular form. Even though the computing device is referred to in the singular form, however, it is understood that a plurality of computing devices may be employed in the various arrangements described above.

Various applications and/or other functionality may be executed in the computing device according to various implementations, which applications and/or functionality may be represented at least in part by the modules that have been described. Also, various data may be stored in a data store that is accessible to the computing device. The data store may be representative of a plurality of data stores as may be appreciated. The data stored in the data store, for example, may be associated with the operation of the various modules, applications and/or functional entities described. The components executed on the computing device may include the modules described, as well as various other



applications, services, processes, systems, engines or functionality not discussed in detail herein.

The client device shown in FIG. 8 may be representative of a plurality of client devices 970 that may be coupled to the network 990. The client device(s) 970 may communicate with the computing device over any appropriate network, including an intranet, the Internet, a cellular network, a local area network (LAN), a wide area network (WAN), a wireless data network or a similar network or combination of networks.

The client device 970 may include a display 985. The display 985 may comprise, for example, one or more devices such as cathode ray tubes (CRTs), liquid crystal display (LCD) screens, gas plasma based flat panel displays, LCD projectors, or other types of display devices, etc.

The client device 970 may be configured to execute various applications such as a browser 975, a respective page or content access application 980 for an electronic retail store and/or other applications. The browser 975 may be executed in a client device 970, for example, to access and render content pages, such as web pages or other network content, such as auditing information, served up by the computing device and/or other servers. The content access application 980 may be executed to obtain and render for display auditing information from the server or computing device, or other services and/or local storage media.

In some implementations, the content access application 980 may correspond to code that is executed in the browser 975 or plug-ins to the browser 975. In other implementations, the content access application 980 may correspond to a standalone application, such as a mobile application. The client device may be configured to execute applications beyond those mentioned above, such as, for example, mobile applications, email applications, instant message applications and/or other applications. Users at client devices 970 may access content features through content display devices or through content access applications 980 executed in the client devices 970.

Although a specific structure may be described herein that defines server-side roles (e.g., of content delivery service) and client-side roles (e.g., of the content access application), it is understood that various functions may be performed at the server side or the client side.

Certain processing modules may be discussed in connection with this technology. In one example configuration, a module may be considered a service with one or more processes executing on a server or other computer hardware. Such services may be centrally hosted functionality or a service application that may receive requests and provide output to other services or customer devices. For example, modules providing services may be considered on-demand computing that is hosted in a server, cloud, grid or cluster computing system. An application program interface (API) may be provided for each module to enable a second module to send requests to and receive output from the first module. Such APIs may also allow third parties to interface with the module and make requests and receive output from the modules.

Reference will now be made to the flow diagrams of FIGS. 10-11, which illustrate methods for implementing a run ticket exchange in accordance with examples of the present technology. According to the diagram of FIG. 10, a method may include receiving 1010 electronic run ticket data from a client device. The electronic run ticket data may represent a transaction and include various data points. The electronic run ticket data may be stored 1020 in a remote exchange data store. Data access permissions may be

assigned 1030 to different ones of the data points. A request may be received 1040 from a participant to the transaction to access the electronic run ticket data. The method may also include restricting 1050 access by the participant to at least one of the data points based on the data access permissions and an identity of the participant. The method may be implemented by an independent third party computing device of a non-participant third-party to the transaction.

Some example data points may include identification of an oil tank, identification of a lease of the oil tank, user credentials for the client device, a transaction time stamp, an ambient temperature at a time of the transaction, a temperature of oil in the oil tank at the time of the transaction, an API (American Petroleum Institute) gravity of the oil, a valve seal identifier, a location history of oil involved in the transaction based on a location history of the client device, and so forth.

The method may include receiving transaction data from the participant(s) to the transaction. The transaction data may be compared to one or more of the data points to identify any discrepancies. The method may include notifying the participant(s) of any identified discrepancies.

The method may include sorting the plurality of data points based on input from the participant and further based on the permissions (e.g., a user may not be permitted to sort data to which permission is not granted, or may be granted limited sorting rights for accessible data).

The method may include manipulating the plurality of data points to obtain derivation data points representing data derived from the plurality of data points. Audit reports may be generated based on the derivation data points and/or based on the electronic run ticket data (i.e., the raw data) for multiple electronic run tickets over a defined time period.

The method may include identifying the participant and other participants based on a combination of the electronic run ticket data and additional data present in the exchange data store prior to receipt of the electronic run ticket data. In other words, the method may store identification of parties to previous transactions and may utilize this data to inform identification of parties to present or future transactions. For example, if in one or more previous transactions, an oil field identifier was submitted in connection with a producer or contact information for a producer, then if a transaction is received where the oil field identifier or contact information or the like is not present, the information from the previous transactions may be utilized to supplement the information available for the present transaction. Other information may be available from third party data stores, from submissions by participants or the like, rather than from previous transaction data, and which may be used to supplement transaction data.

Referring to FIG. 11, another example method is illustrated in accordance with an example. The method may include receiving 1110 electronic run ticket data from a client device, where the electronic run ticket data may represent a transaction. The electronic run ticket data may represent a transaction and may include a number of data points. The electronic run ticket data may be stored 1120 in an exchange data store. Participants to the transaction may be identified 1130 and such identification may be stored with the electronic run ticket data in the exchange data store. If a request is received 1140 from the participant to the transaction to access the electronic run ticket data, access by the participant to the electronic run ticket data may be granted 1150, such as based on credentials, permissions associated with the credentials, relationships to other par-



participants to the transaction or involvement with specific portions of the transaction, and so forth.

The method may further include assigning data access permissions to different ones of the data points and restricting access by the participant to at least one of the data points based on the data access permissions and the identity of the participant. In one example, a client device used to access the data may be authenticated using a single use authentication code received through the client device.

The method may include performing calculations on the data. For example, the method may include calculating a time period for completion of the transaction by tracking time stamping at multiple times during the transaction, and reporting the time period for completion to the participant. The method may include deriving or calculating additional data points based on a plurality of data points in the electronic run ticket data and determining whether to display the additional data points to the participant based on the identity of the participant. Also, the method may include calculating a volume of oil in an oil tank involved in the transaction based on a temperature and an API (American Petroleum Institute) gravity of the oil.

The method may include storing tracked movement of the client device, and transmitting this movement to a second client device for a second truck driver for use as navigation instructions. The method may include maintaining an oil lease data store identifying oil lease candidates for transactions and locations of the oil lease candidates. The method may include responding to requests for oil lease candidate identification based on Global Positioning System (GPS) coordinates of the client device.

The method may include storing a bar code for a valve seal of an oil tank received from the client device. Run tickets for a plurality of oil tanks may be associated with one another when a truck leases oil from the plurality of oil tanks in order to indicate that the multiple run tickets are part of a single transaction.

For simplicity of explanation, the methods depicted and described herein may be depicted and described as a series of acts. However, acts in accordance with this disclosure can occur in various orders and/or concurrently, and with other acts not presented and described herein. Furthermore, not all illustrated acts may be required to implement the methods in accordance with the disclosed subject matter. In addition, those skilled in the art will understand and appreciate that the methods could alternatively be represented as a series of interrelated states via a state diagram or events. Additionally, it should be appreciated that the methods disclosed in this specification are capable of being stored on an article of manufacture to facilitate transporting and transferring such methods to computing devices. The term article of manufacture, as used herein, is intended to encompass a computer program accessible from any computer-readable device or storage media.

Any of a variety of other process implementations which would occur to one of ordinary skill in the art, including but not limited to variations or modifications to the process implementations described herein, are also considered to be within the scope of this disclosure.

FIG. 12 illustrates a computing device 1210 on which services or modules of this technology may execute. A computing device 1210 is illustrated on which a high level example of the technology may be executed. The computing device 1210 may include one or more processors 1212 that are in communication with memory devices 1220. The computing device 1210 may include a local communication interface 1218 for the components in the computing device.

For example, the local communication interface 1218 may be a local data bus and/or any related address or control busses as may be desired.

The memory device 1220 may contain modules 1230 that are executable by the processor(s) and data for the modules. A data store 1222 may also be located in the memory device 1220 for storing data related to the modules and other applications along with an operating system that is executable by the processor(s) 1212.

The computing device 1210 may further include or be in communication with a client device, which may include a display device. The client device may be available for an administrator to use in interfacing with the computing device 1210, such as to review operation of a virtual computing instance, make improvements to machine learning models and so forth.

Various applications may be stored in the memory device 1220 and may be executable by the processor(s) 1212. Components or modules discussed in this description that may be implemented in the form of software using high programming level languages that are compiled, interpreted or executed using a hybrid of the methods.

The computing device 1210 may also have access to I/O (input/output) devices 1214 that are usable by the computing devices. An example of an I/O device 1214 is a display screen that is available to display output from the computing devices. Other known I/O device may be used with the computing device as desired. Networking devices 1216 and similar communication devices may be included in the computing device 1210. The networking devices 1216 may be wired or wireless networking devices 1216 that connect to the internet, a LAN, WAN, or other computing network.

The components or modules that are shown as being stored in the memory device 1220 may be executed by the processor 1212. The term "executable" may mean a program file that is in a form that may be executed by a processor 1212. For example, a program in a higher level language may be compiled into machine code in a format that may be loaded into a random access portion of the memory device 1220 and executed by the processor 1212, or source code may be loaded by another executable program and interpreted to generate instructions in a random access portion of the memory to be executed by a processor 1212. The executable program may be stored in any portion or component of the memory device 1220. For example, the memory device 1220 may be random access memory (RAM), read only memory (ROM), flash memory, a solid state drive, memory card, a hard drive, optical disk, floppy disk, magnetic tape, or any other memory components.

The processor 1212 may represent multiple processors and the memory 1220 may represent multiple memory units that operate in parallel to the processing circuits. This may provide parallel processing channels for the processes and data in the system. The local interface may be used as a network to facilitate communication between any of the multiple processors and multiple memories. The local interface may use additional systems designed for coordinating communication such as load balancing, bulk data transfer, and similar systems.

While the flowcharts presented for this technology may imply a specific order of execution, the order of execution may differ from what is illustrated. For example, the order of two more blocks may be rearranged relative to the order shown. Further, two or more blocks shown in succession may be executed in parallel or with partial parallelization. In some configurations, one or more blocks shown in the flow chart may be omitted or skipped. Any number of counters,



state variables, warning semaphores, or messages might be added to the logical flow for purposes of enhanced utility, accounting, performance, measurement, troubleshooting or for similar reasons.

Some of the functional units described in this specification have been labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module may be implemented as a hardware circuit comprising custom VLSI circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

Modules may also be implemented in software for execution by various types of processors. An identified module of executable code may, for instance, comprise one or more blocks of computer instructions, which may be organized as an object, procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but may comprise disparate instructions stored in different locations which comprise the module and achieve the stated purpose for the module when joined logically together.

Indeed, a module of executable code may be a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data may be identified and illustrated herein within modules, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different storage devices. The modules may be passive or active, including agents operable to perform desired functions.

The technology described here may also be stored on a computer readable storage medium that includes volatile and non-volatile, removable and non-removable media implemented with any technology for the storage of information such as computer readable instructions, data structures, program modules, or other data. Computer readable storage media include, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tapes, magnetic disk storage or other magnetic storage devices, or any other computer storage medium which may be used to store the desired information and described technology. The computer readable storage medium may, for example, be in the form of a non-transitory computer readable storage medium. As used herein, the terms "medium" and "media" may be interchangeable with no intended distinction of singular or plural application unless otherwise explicitly stated. Thus, the terms "medium" and "media" may each connote singular and plural application.

The devices described herein may also contain communication connections or networking apparatus and networking connections that allow the devices to communicate with other devices. Communication connections are an example of communication media. Communication media typically embodies computer readable instructions, data structures, program modules and other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. A "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not

limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency, infrared, and other wireless media. The term computer readable media as used herein includes communication media.

It is noted that any of the distributed system implementations described above, or any of their components, may be implemented as one or more web services. In some implementations, a web service may be implemented by a software and/or hardware system designed to support interoperable machine-to-machine interaction over a network. A web service may have an interface described in a machine-processable format, such as the Web Services Description Language (WSDL). Other systems may interact with the web service in a manner prescribed by the description of the web service's interface. For example, the web service may define various operations that other systems may invoke, and may define a particular application programming interface (API) to which other systems may be expected to conform when requesting the various operations.

In various implementations, a web service may be requested or invoked through the use of a message that includes parameters and/or data associated with the web services request. Such a message may be formatted according to a particular markup language such as Extensible Markup Language (XML), and/or may be encapsulated using a protocol such as Simple Object Access Protocol (SOAP). To perform a web services request, a web services client may assemble a message including the request and convey the message to an addressable endpoint (e.g., a Uniform Resource Locator (URL)) corresponding to the web service, using an Internet-based application layer transfer protocol such as Hypertext Transfer Protocol (HTTP).

In some implementations, web services may be implemented using Representational State Transfer ("RESTful") techniques rather than message-based techniques. For example, a web service implemented according to a RESTful technique may be invoked through parameters included within an HTTP method such as PUT, GET, or DELETE, rather than encapsulated within a SOAP message.

Reference was made to the examples illustrated in the drawings, and specific language was used herein to describe the same. It will nevertheless be understood that no limitation of the scope of the technology is thereby intended. Alterations and further modifications of the features illustrated herein, and additional applications of the examples as illustrated herein, which would occur to one skilled in the relevant art and having possession of this disclosure, are to be considered within the scope of the description.

Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more examples. In the preceding description, numerous specific details were provided, such as examples of various configurations to provide a thorough understanding of examples of the described technology. One skilled in the relevant art will recognize, however, that the technology may be practiced without one or more of the specific details, or with other methods, components, devices, etc. In other instances, well-known structures or operations are not shown or described in detail to avoid obscuring aspects of the technology.

Although the subject matter has been described in language specific to structural features and/or operations, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features and operations described above. Rather, the specific features and acts described above are disclosed as example



forms of implementing the claims. Numerous modifications and alternative arrangements may be devised without departing from the spirit and scope of the described technology.

The invention claimed is:

**1.** A system configured to implement an electronic run ticket exchange, comprising:

a processor;

a memory in electronic communication with the processor and comprising instructions that, when executed by the processor, cause the system to:

receive electronic run ticket data from a client device, the electronic run ticket data representing a fluid transaction and including a plurality of data points;

store the electronic run ticket data in an exchange data store;

transform the electronic run ticket data to create an additional data point to be included in the electronic run ticket data based on the plurality of data points;

manage access to the electronic run ticket data by participants to the fluid transaction;

report the electronic run ticket data, including the additional data point, to the participants.

**2.** The system of claim **1**, wherein the instructions further cause the system to:

manage access to the electronic run ticket data by assigning data access permissions to different data points included in the electronic run ticket data, and

restrict access by one of the participants to at least one of the different data points based on the data access permissions and an identity of the one of the participants.

**3.** The system of claim **2**, wherein the participants include at least three participants and the data access permissions allow a first at least two of the at least three participants to share first data, a second at least two of the at least three participants to share second data excluded from access by one participant of the first at least two of the at least three participants, and at least one of the at least three participants to access data excluded from access by another two of the at least three participants.

**4.** The system of claim **1**, wherein the client device represents one of the participants and the instructions further cause the system to:

receive supplemental data from another one of the participants to supplement the electronic run ticket data; map the supplemental data to the electronic run ticket data;

compare the supplemental data to the electronic run ticket data; and

report comparison results of the supplemental data compared to the electronic run ticket data to the participants.

**5.** The system of claim **4**, wherein the comparison results include a discrepancy between the supplemental data and the electronic run ticket data, where the discrepancy is a difference outside of a predefined threshold, and the instructions further cause the system report the discrepancy to a subset of participants to the transaction.

**6.** The system of claim **1**, wherein the plurality of data points comprises one or more data points selected from the group consisting of: identification of the producer, possible identification of the delivery location and receiving party, identification of an oil tank, identification of a lease of the oil tank, user credentials for the client device, a transaction time stamp, a temperature of oil in the oil tank at the time

of the transaction, an API (American Petroleum Institute) gravity of the oil, and a valve seal identifier.

**7.** The system of claim **1**, wherein the instructions that cause the system to transform the electronic run ticket data to create the additional data point cause the system to perform one or more of: calculating a fluid volume, converting a format of electronic run ticket data between a client format and a run ticket exchange format, generating trends based on a plurality of electronic run tickets, recognizing or converting text, recognizing patterns in the electronic run ticket data, or forecasting future electronic run ticket data.

**8.** The system of claim **1**, wherein the fluid transaction is a transaction for water or oil.

**9.** The system of claim **1**, wherein the instructions that cause the system to transform the electronic run ticket data to create the additional data point cause the system to: compare a difference between two data points of the plurality of data points of a first type of measurement and calculate a new data point as a second type of measurement, then modify the new data point based on another data point of third type of measurement to create the additional data point, each of the first, second and third types of measurement representing measurements of physical characteristics relating to the transaction and having different units and methods of measurement.

**10.** A computer implemented method, comprising:

receiving electronic run ticket data from a client device, wherein the electronic run ticket data represents a transaction for fluid;

storing the electronic run ticket data in an exchange data store;

transforming the electronic run ticket data to create additional data to be included in the electronic run ticket data using a processor;

managing access to the electronic run ticket data by participants to the transaction; and

reporting the electronic run ticket data, including the additional data, to the participants.

**11.** The computer implemented method according to claim **10**, further comprising communicating the electronic run ticket data between the exchange data store and a participant device using an application program interface (API).

**12.** The computer implemented method according to claim **10**, further comprising notifying participants when the electronic run ticket data is received from the client device, when the electronic run ticket data includes an error, when supplemental data has been received from one of the participants, or when the electronic run ticket data has been modified.

**13.** The computer implemented method according to claim **12**, further comprising analyzing the electronic run ticket data to identify the error, and providing an interface for the participants to reconcile the error.

**14.** The computer implemented method according to claim **10**, further comprising providing a user interface for reconciliation of error, input of additional data, request for changes in data, or completing or reporting a payment for the fluid.

**15.** The computer implemented method according to claim **10**, further comprising:

defining differing account types for parties associated with each of the participants, where the differing account types have separate constraints on data access and notifications from one another,

identifying an account type based on credentials used to access the exchange data store, and



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configuring a display of the electronic run ticket data based on the account type.

16. The computer implemented method according to claim 10, wherein reporting the electronic run ticket data comprises generating and providing an operational report of participants, including fluid transactions, transaction times, transit status, payment status, fluid quantity, and fluid quality.

17. The computer implemented method of claim 10, further comprising calculating a time period for completion of the transaction by tracking time stamps at multiple times during the transaction, and reporting the time period for completion to the participants.

18. The computer implemented method of claim 10, further comprising converting a bar code for a valve seal of an oil tank received from the client device as part of the electronic run ticket data to a number as the additional data.

19. An electronic run ticket exchange system, comprising: an exchange data store configured to store electronic run ticket data received from a client device, the electronic run ticket data representing a transaction for fluid and includes variable and fixed data points;

a rules data store in communication with the computing device and configured to store rules for transforming the electronic run ticket data;

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a processor configured to:

transform the electronic run ticket data based on the rules to generate transformed electronic run ticket data;

manage access to the electronic run ticket data by participants to the transaction; and

report the transformed electronic run ticket data to the participants.

20. The electronic run ticket exchange system according to claim 19, wherein the electronic run ticket exchange system is an independent, non-participant third-party to the transaction having a trust relationship with the participants defined in part by exchange of the electronic run ticket data and the transformed electronic run ticket data as well as by access permissions for the participants to access the electronic run ticket data and the transformed electronic run ticket data.

21. The electronic run ticket exchange system according to claim 19, wherein the transformed electronic run ticket data includes fluid volume calculations which are calculated by the processor based on physical measurements of non-volume fluid characteristics by one of the participants and shared with each of the participants at a same, defined time following the transaction.

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